REMEDIAL INVESTIGATION/FEASIBILITY STUDY (RI/FS)
PHASE 1A
DATA BASE SUMMARY REPORT

PETERSON/PURITAN SITE - OPERABLE UNIT 2
CERCLA DOCKET NO. 1-87-1064

Town of Cumberland
Rhode Island

DECEMBER 2003

Peterson/Puritan
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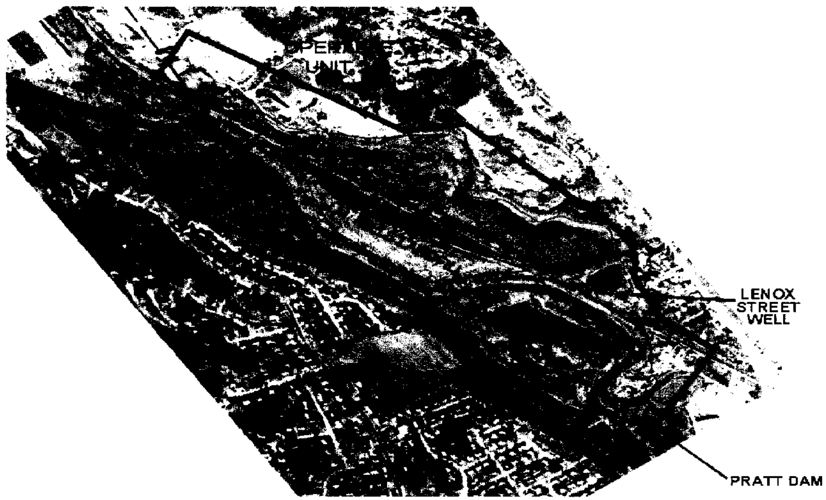

Prepared by:

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Environmental Associates, Inc.
Lexington, Kentucky

SHIELD
ENVIRONMENTAL ASSOCIATES, INC.

LETTER OF TRANSMITTAL

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TO: Mr. David Newton
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ATE: 12/29/03 **JOB NO:** 300-1820

SUBJECT: RI/FS Data Summary Report
Peterson/Puritan-OU2 Site
Cumberland, Rhode Island

WE ARE SENDING YOU:

- ☐ *Attached*
- ☒ *Under Separate Cover*
- ☐ *The Following Items:*
- ☒ *Report*
- ☐ *Estimate*
- ☐ *Plans*
- ☐ *Analyses*
- ☐ *Copy of Letter*
- ☐ *Change Order*
- ☐ *Samples*
- ☐ ____________

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3	Dec 2003	Peterson/Puritan OU2 RI/FS Data Summary Report (Document Control Nos. 001, 019 and 020)

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- ☐ *Approved as Submitted*
- ☐ *For Your Information and Files*
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- ☐ *For Your Necessary Action*
- ☐ *As Requested*
- ☐ *Returned for Corrections*
- ☐ *For Your Review and Comment*

REMARKS:

Dear Dave,

Enclosed please find three copies of the Data Summary Report for Phase 1A of the Peterson/Puritan OU2 Superfund site RI/FS; one copy for your files and one copy each for the Cumberland and Linclon repositories. Please call if you have any questions.

Sincerely,

Michael E. Morris
Shield Environmental Asssociates, Inc.

COPY TO:

SIGNED: [signature]

Phase 1A Data Base Summary Report

Remedial Investigation and Feasibility Study

Peterson/Puritan Superfund Site - Operable Unit 2 (OU2)
Cumberland, Rhode Island

CERCLA Docket No. 1-87-1064

Prepared by:

Shield Environmental Associates, Inc.
Lexington, Kentucky
December 2003

Shield Project No. 300-1821

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Introduction

The United States Environmental Protection Agency (USEPA) included the Peterson/Puritan, Inc. Superfund Site on the Superfund National Priorities List (NPL) on September 8, 1983. The requirement for a Remedial Investigation and Feasibility Study (RI/FS) at the Peterson/Puritan Site was agreed to in the Administrative Order on Consent (AOC), Comprehensive Environmental Resource and Conservation Liability Act (CERCLA) Docket No. 1-87-1064, dated May 29, 1987. The Consent Order was further amended and agreed to in a First Amendment dated March 10, 1992, and a Second Amendment dated July 13, 2001.

In the Second Amendment to the AOC, CCL Custom Manufacturing, Inc. (CCL) and Unilever/Bestfoods (Unilever) agreed to take the lead in completing the RI/FS for the second unit, Operable Unit 2 (OU2). In November 2000, the USEPA issued a final Statement of Work (SOW) for the RI/FS in OU2. The group of industries referred to as the Potentially Responsible Parties (PRP) Group, which included CCL and Unilever, retained Shield Environmental Associates, Inc. (Shield) to prepare a RI/FS Work Plan and implement the SOW.

The RI/FS Work Plan (Final – June 2003) was approved by the USEPA on July 1, 2003. The Phase 1A field effort, as described in the Work Plan and associated documents, was performed by Shield between August 3 and October 24, 2003. The schedule of field activities conducted during that period is summarized in Table 1.

This document, the RI/FS Data Base Summary Report (DBSR), is the first deliverable required in the SOW after the Work Plan. It is intended to summarize all field and analytical data collected during Phase 1A. The data collected have been organized into appendices, tables, plates, and CD-ROMs, as described in the Table of Contents. A description of the field activities is contained in Appendix A, and a list of supplements and revisions to the standard operating procedures (SOPs) in the Work Plan is in Appendix B. The data in Appendices C through K will be referenced in the next deliverable required by the SOW, a report referred to as the Initial Site Characterization Report (ISCR). A full explanation and interpretation of the data collected during Phase 1A will be provided in the text of the ISCR. The DBSR is intended only to document the data collection activities and present the data collected, prior to the full interpretation.

Appendix A

Appendix A Description of Field Activities

A Description of Field Activities

The field activities planned for Phase 1A were specified in the RI/FS Work Plan (Final – June 2003), specifically the Field Sampling Plan (FSP), the Quality Assurance Project Plan (QAPP), and the standard operating procedures (SOPs) contained therein. Supplements and revisions to the SOPs developed after the Work Plan was approved are provided in Appendix B of this report. Photographs taken during the Phase 1A field activities are provided on a CD-ROM at the end of this report, with captions describing the photographs in Appendix C.

A1. Site Access and Approvals

Performance of the RI/FS Phase 1A activities planned for the Peterson/Puritan OU2 was dependent upon securing authorized access and cooperation from the many landowners within the OU2 area. Site access and approvals were secured from most landowners prior to the initiation of the Phase 1A fieldwork. An access agreement for the Stop N Shop shopping center was executed on September 18, 2003. Copies of the access agreements have been provided to the USEPA under separate cover. Table 2 is an updated list of the properties involved, contacts, and the status of site access as of October 2003.

A2. Site Surveys

An aerial survey of the Peterson/Puritan Superfund site and topographic mapping were performed in 2000 on behalf of the USEPA (EPIC PIC# 20101134S, from photography dated November 21, 2000). The topographic map provided by the USEPA served as the base for the site maps used in the RI/FS (specifically, the plates included in this report). The base map contains standard topographic, physiographic, cultural, and facility features. Approximate property lines have been added based upon deed research and mapping performed by Cherenzia and Associates in 2001 and provided previously to the USEPA.

Field locations sampled or measured in Phase 1A were located by Shield on the base map using a Trimble GeoExplorer 3® global positioning system (GPS). Coordinates measured using the GPS were downloaded, corrected, and converted to the Rhode Island State planar coordinate system using Pathfinder® GPS software, and plotted on the maps included with this report. Plate 1 is a map of OU2 showing the approximate property boundaries along with well and piezometer locations.

The vertical datum most commonly used currently is the North American vertical datum of 1988 (NAVD88). The original photogrammetry for the map provided by the USEPA, performed by Eastern Topographics of Wolfeboro, New Hampshire, yielded topography tied to the NAVD88. However, the topography was converted by the USEPA (verbal communication with Terry Stonaker at USEPA EPIC in September 2003) and the vertical datum on the map the USEPA provided to Shield, which is also the datum that has been used for all surveys in OU1, is the national geodetic vertical datum of 1929 (NGVD29).

Shield retained Tilton & Associates, Inc. (Tilton) of North Attleboro, Massachusetts, and Stratford, Connecticut, to perform vertical surveys to tie selected reference points to the site datum. In August 2003, Tilton surveyed the ground surface elevation and the top of the inner casing at each of the existing wells in OU2. In addition, Tilton surveyed the top of pipe at each of the piezometers and combination piezometer/staff gauges installed by Shield. Tilton also set benchmarks near each of the piezometers so they could be resurveyed more easily in the spring after flooding. In September 2003, Tilton surveyed the ground surface elevation and the top of the inner casing at each of the nine new wells installed by Shield. In addition, Tilton rechecked the elevations of selected piezometers installed in or near the Blackstone River.

Two culvert headwalls (HW-1 and HW-2) were also surveyed to supplement the available measuring points for surface water elevations. HW-1 is the headwall on the upstream end of the culvert that drains under the railroad track to the Blackstone River, carrying drainage from the area of the sand and gravel pit, in the vicinity of MW-106, PZ-14 and PZ-15 on the north end of the landfill. HW-2 is a headwall on the downstream end of a culvert discharging to a drainageway that runs parallel to the railroad on its northeast side, and drains to the southeast. The inlet for this culvert is not known.

All the elevations surveyed by Tilton were initially reported relative to NAVD88 and converted to NGVD29 by adding 0.79 feet. Tilton has indicated that this conversion can be applied areawide across OU2. The elevation data for the surveys performed in Phase 1A are summarized in Table 3.

A3. Mobilization, Grading, Decontamination, and Waste Management

On August 4, 2003, Shield began to mobilize equipment to the site for the RI activities. A temporary office trailer was delivered and set up at the CCL facility located at 35 Martin Street in Cumberland, Rhode Island (next to the treatment plant for OU1). Shield submitted applications to the Town of Cumberland for a building permit and electrical service.

On August 6, 2003, clearing activities began at the toe of the landfill in order to construct a haul road and two additional paths for electromagnetic induction (EMI) and electrical conductivity/membrane interface probe (EC/MIP) surveys. Shield subcontracted TMC Services, Inc. (TMC) of Bellingham, Massachusetts, to provide the heavy equipment and operators needed to perform the clearing activities, construct the haul road, and build a decontamination pad and waste staging area. The clearing activities and the haul road construction were performed during the period of August 6 through August 13, 2003. Rock and geotextile fabric were delivered to the site and used to level and provide traction in low-lying areas on the haul road. On August 13 and 14, 2003, a decontamination pad and waste staging area were constructed near the south gate of the landfill.

Soil cuttings and solid wastes such as sampling gloves, Tyvek® protective suits, plastic sheeting, and plastic tubing were staged in 55-gallon drums within the waste staging area. Decontamination, purge, and development water were initially staged in 55-gallon drums. The water was later transferred to a 6,500-gallon holding tank that was also located within the waste staging area.

The decontamination of soil, sediment, and surface water sampling equipment was conducted in accordance with Section 4.0 of Shield’s SOP for the Decontamination of Sampling Equipment (SEA-01-01 Decon, Rev. #2). Specifically, the equipment was initially washed with potable water and Alconox® detergent. Following a potable water rinse, each piece of sampling equipment was rinsed in the following order: 10% reagent-grade nitric acid, deionized water provided by Mitkem Corporation (Mitkem), pesticide-grade methanol, deionized water, hexane, and a final rinse with deionized water.

Section 5.0 of the SOP for the Decontamination of Sampling Equipment describes the procedures for decontaminating monitoring equipment and pumps. These procedures were used during the decontamination of the electrical submersible pumps used for well development and testing. The bladder pumps used during the low-flow sampling were completely disassembled between sampling points and decontaminated using the steps described above and as outlined in Section 4.0 of the SOP. All heavy equipment was decontaminated with a pressure washer at the decontamination pad in accordance with Section 6.0 of the SOP.

The Phase 1A fieldwork generated 19 drums of solid waste and 3,005 gallons of water. A composite sample of the soil cuttings and a grab sample of the water were collected and analyzed for waste characterization by Mitkem. Clean Harbors was subcontracted to transport and dispose of the nonhazardous, investigation-derived waste (IDW). The IDW was removed from the site on December 4, 2003, and documentation of the removal activities was provided to the USEPA with the project Status Report dated December 15, 2003.

A4. Air Monitoring During Intrusive Activities

Shield performed air monitoring during all intrusive activities (test trenching and drilling) in accordance with the site-specific Health and Safety Plan (HASP) and Shield's SOP for Field Air Monitoring (SEA-08-02 Air Monitoring, Rev. #2). Continuous ambient air readings were collected with a MiniRAE Plus® photoionization detector (PID), an Industrial Scientific MX251 lower explosive limit (LEL) and oxygen (O_2) multigas monitor, an MIE Personal Data RAM particulate monitor, and a Victoreen 190 radiation monitor. The readings from the breathing zone were recorded at approximately 15-minute intervals on an Air Monitoring Log.

The air monitoring results did not exceed the levels established in the HASP during any of the intrusive activities conducted at the site. Therefore, the potential response actions specified in the HASP (e.g., monitoring of specific compounds, upgrading personal protective equipment [PPE], and conducting air monitoring at the property boundary) were not warranted.

A5. Subsurface Screening Surveys

A variety of investigative and sampling techniques were employed during the Phase 1A activities to characterize potential source areas, including those containing buried waste and surface debris. The subsurface screening surveys described in this section were intended to help define the extent of the buried waste in potential source areas and to also provide a preliminary characterization of potential hot spots to guide later characterization and sampling investigations in Phase 1A. The two investigative techniques selected in the Work Plan for this purpose were surface geophysical surveys using EMI and subsurface probing surveys using an EC/MIP. The locations of the survey lines and points are shown on Plate 2. The procedures and results are described in more detail below.

A5.1 Electromagnetic Induction (EMI) Surveys

The EMI method detects conductivity contrasts between potentially contaminated soils and/or manmade wastes and uncontaminated soils and other earth materials. The EMI surveys in Phase 1A were conducted by Mr. Peter Hubbard of Weston Geophysical, Inc. (Northborough, Massachusetts) using a Geophex® GEM-2 multifrequency electromagnetic instrument. Two survey reports provided by Weston Geophysical are reproduced in Appendix D (D1 and D2). The survey methods and results are summarized in this section.

The purpose of the EMI survey planned for the toe of the landfill was to evaluate the potential presence of buried waste and to identify potential subsurface anomalies (if any) that could be related to contamination emanating from the landfill via the ground water pathway. The decision was made to perform this survey prior to test trenching to assist in guiding those investigations for buried waste delineation. The EMI survey at the toe of the landfill was conducted on August 12 and 13, 2003.

Three continuous EMI profile lines were traversed at the toe of the landfill. Plate 2 shows the locations of the profile lines as well as the locations of the staked control points spaced 200 feet apart along each line. The results of the survey indicated that the profile line closest to the river (Line 2) showed very low conductivity contrasts. The data along Line 2 were not indicative of landfill material. The profile data collected in areas along the beginning of Line 1 and all of Line 3 were consistent with buried landfill material. A complete report entitled *Geophysical Investigation, Electromagnetic*

Induction Survey at the Peterson/Puritan OU2 Facility, Cumberland, Rhode Island was submitted by Weston Geophysical in August 2003 and is contained in Appendix D1.

Toward the end of the Phase 1A field activities, a second EMI survey was conducted on the unnamed island to evaluate the presence or absence of buried waste on the northeastern perimeter of the island, where no test trenching had been performed initially. The EMI survey on the unnamed island was conducted on October 7, 2003.

One continuous EMI profile line (2,900 feet) surrounding the northern and northeastern portions of the island was traversed, as well as an additional 200-foot line on the southwestern portion of the island. Survey control points were established at 100-foot increments for each profile line, with survey stakes placed at 300-foot increments. Plate 2 shows the profile lines, along with the locations of the control points spaced at 300-foot increments. Some anomalies, indicated by high frequency and a conductivity signal contrast, were detected between stations 0700 to 1700 on Line 1 and between stations 0000 and 0120 on Line 2. A complete report entitled *Geophysical Investigation at the Un-named Island* was submitted by Weston Geophysical on October 8, 2003 and is contained in Appendix D2.

A5.2 Electrical Conductivity/Membrane Interface Probe (EC/MIP) Survey

The purpose of the EC/MIP survey was to detect the presence of total volatile organic compounds (TVOCs) in the subsurface hydraulically downgradient of the landfill. The presence of TVOCs in the subsurface could indicate a preferential pathway or source area for potential ground water contamination.

On August 19, 2003, ZEBRA Environmental Corporation (Zebra) of Lynbrook, New York, mobilized a van-mounted EC/MIP to the site. The EC/MIP unit was equipped with a PID, a flame ionization detector (FID), and an electron capture detector (ECD) along with the necessary probes, gases, and supplies needed for EC/MIP logging. The EC/MIP probe was advanced into the subsurface using a Model 5400 Geoprobe® unit.

During the period of August 19-28, 2003, a total of 45 EC/MIP points were advanced into the subsurface at the locations shown on Plate 2. The points were spaced at 50-foot intervals and were advanced to approximately 10 feet below the ground surface. The points spaced at approximately 200-foot intervals were advanced approximately 30 feet below the ground surface. Soil gases were monitored continuously over the entire depth of each boring. The EC/MIP survey was conducted in accordance with Shield's SOP for the Membrane Interface Probe (SEA-09-01 MIP, Rev #2).

The results of the EC/MIP survey are outlined in detail in the *Summary Report for Direct Sensing Services* prepared by Zebra and dated September 23, 2003. A copy of the report is contained in Appendix D3. Using the PID and ECD, all boring logs showed a negligible response above the baseline for volatile organic compounds (VOCs). The FID did respond, although at very low levels, to compounds at a depth of about 4-5 feet below the ground surface. Given that the investigation was performed in a landfill area, and ruling out the presence of aromatic and halogenated compounds that are detected with the PID and ECD, it may be assumed that the FID was indicating the presence of natural gases such as methane created by the decomposition of landfill materials.

A6. Test Trenching

The overall objective of the investigations and sampling performed in potential source or waste areas was to characterize the types and extent of wastes in these areas. The approach included mapping the extent of the surface debris and buried waste and sampling the environmental media directly associated with the waste. Test trenching was used both to investigate/map areas of buried waste and to collect samples for laboratory analyses. The media sampled in the test trenches during Phase 1A included waste soil (defined for the purpose of this RI/FS as soil in direct contact with waste materials) and ground water leachate (defined for the purpose of this RI/FS as ground water in direct contact with waste materials).

In the RI/FS Work Plan, test trenching was planned for two areas of the site: the unnamed island (to investigate the potential for buried waste) and the landfill (to define the extent of buried waste). Test trenches and sampling locations on the unnamed island are shown on Plate 3, and Plate 4 shows the test trench and sampling locations in the vicinity of the landfill.

TMC was subcontracted to perform the trenching activities using a track-mounted excavator. Descriptions of the materials found in each trench and the trench dimensions have been recorded on the Trenching Logs contained in Appendix E (E1).

A6.1 Unnamed Island

The Work Plan originally proposed 10 test trenches on the unnamed island, based upon a review of the detailed topographic mapping provided by the USEPA and historical aerial photographs. Test trenching activities were initially performed on August 14 and 15, 2003 and continued on August 18-20, 2003. Due to the extensive amount of buried waste encountered during the initial trenching activities, additional test trenches were excavated to help define the lateral extent of the buried waste. On October 24, 2003, at the end of the Phase 1A fieldwork, additional trenches were excavated along the northeastern perimeter of the unnamed island to confirm the absence of buried waste in that area. A total of 34 test trenches (UI-TT-01 through UI-TT-32, UI-TT-17A, and UI-TT-18A) were excavated on the unnamed island; the trenching locations are shown on Plate 3.

Waste was encountered in two general areas on the unnamed island. Construction/ demolition debris that included mainly brick and metal piping was encountered in elongated mounds adjacent to Pond A and surrounding Pond E. Additionally, a large number of tires, both buried and on the surface, were found within and in the vicinity of Pond E. The mounded debris did not extend below the original ground surface or the current ground water table. A small area of buried waste that included household appliances, brick, wire, car parts, and a 200- to 300-gallon steel tank was found on the southern side of Pond A (in the vicinity of the construction/demolition debris mounds). The waste was buried to a depth of approximately 8 feet below the ground surface to just above the current water table.

A second and larger area of waste disposal was encountered on the southwestern side of the island between Pond D and the secondary branch of the Blackstone River. The waste in this area was mainly industrial in nature and included different types of plastics, wire, glass, hose, wood, tires, and some medical waste. The approximate lateral extent of the waste is shown on Plate 3. Waste materials were buried under 1 to 2 feet of soil and extended to depths of 6 to 16 feet below the ground surface depending upon the location and surface features. Waste in this area extended below the current ground water table.

Ground water leachate and waste samples were collected from two test trenches on the unnamed island and submitted for laboratory analyses. The samples from test trench

UI-TT-06 (GW-LE01-UI and SO-W01-UI) and test trench UI-TT-10 (GW-LE02-UI and SO-W02-UI) were collected using the excavator bucket and transferred into the appropriate sample containers using a clean glass jar. Additionally, one composite waste sample (SO-W03-UI) was collected from test trenches UI-TT-01 and UI-TT-02, and one grab waste sample (SO-W04-UI) was collected from test trench UI-TT-03.

A6.2 Landfill

During the period of August 21-22, 2003, 11 test trenches (LF-TT-01 through LF-TT-11) and four smaller test pits (LF-TP-01 through LF-TP-04) were excavated around the perimeter of the landfill to establish the presence and lateral extent (if possible) of the buried waste. Test pits (smaller excavations) were excavated on the northern side of the landfill to establish the presence/absence of waste only. Surface debris, buried utilities, and other constraints prevented the excavation of more extensive trenches in these areas. Landfill test trench, test pit, and sampling locations are shown on Plate 4, and trenching logs are provided in Appendix E1.

Waste was encountered from approximately 12 to 16 feet below the ground surface at the toe of the landfill adjacent to the Blackstone River, with approximately 0 to 2 feet of soil cover. Waste was found to extend to or below the ground water surface in all trenches. Wastes typically found in most of the test trenches included plastic, brick, wood, hose, and tires.

Four additional test pits were excavated between trench LF-TT-11 and MW-106. Buried waste was found in three of the four test pits. Additional trenching in this area was not possible due to the extensive amount of surface debris. Observations at the bank of the Blackstone River in this area suggest that buried waste is present from approximately 50 feet south of the Providence & Worcester (P&W) Railroad to the Blackstone River.

Ground water leachate samples were collected for laboratory analyses from three test trenches. Test trench LF-TT-02 (GW-LE03-LF), test trench LF-TT-07 (GW-LE04-LF) and test trench LF-TT-09 (GW-LE05-LF) were sampled using the excavator bucket. The samples were transferred into the appropriate sample containers using a clean glass jar.

A6.3 Quality Assurance/Quality Control Samples

The following equipment rinsate, field duplicate, and matrix spike/matrix spike duplicate (MS/MSD) samples were collected during the ground water leachate and waste sampling conducted during the test trenching:

A6.3.1 Equipment Rinsates

- GW-ER01 collected after GW-LE01-UI

A6.3.2 Field Duplicates

- SO-FD02 duplicate of SO-W04-UI

A6.3.3 MS/MSD

- SO-W04-UI

A7. Soil Borings

Soil borings were selected to investigate the subsurface at the transfer station property (Nunes Property) because, at the time the Work Plan was being prepared, this property was an active transfer station and the soil borings would be less invasive and easier to seal than test trenches. Before the Phase 1A field activities were initiated, this property was sold by the Nunes family and most of the surface waste stockpiles and debris had been removed prior to Shield's mobilization.

On September 5 and 6, 2003, a total of eight soil borings (GP-1 through GP-8) were drilled at the site using a track-mounted Geoprobe® direct-push hydraulic rig operated by Geologic-Earth Exploration, Inc. (Geologic). The soil boring and sampling locations are shown on Plate 3. All borings were logged in accordance with Shield's SOP for Logging Subsurface Borings (SEA–02-03 Subsurface Log, Rev. #2). The soil boring logs are provided in Appendix E2.

A7.1 Transfer Station (Nunes Property)

The following types of samples were collected from the Geoprobe® borings:

- Surface Soil. Five surface soil samples (SO-033-NP through SO-037-NP) were collected at the transfer station using the Geoprobe® rig. A 4-foot-long, 2-inch-diameter, stainless steel sampling tube with an acetate liner was advanced into the ground using a hydraulic-powered, direct-push sampler. After removal from the ground, the soil core was removed from the acetate liner and described. A Terra-Core® sampler was used to extract a sample for VOC analysis from the soil core at a depth of 6 inches below the ground surface. The remaining top 1 foot of the sample core was composited in a stainless steel bowl and placed in the appropriate containers for the remaining analyses. Subsequent deeper sampling at the transfer station revealed that these surface soil samples, with the exception of SO-036-NP, were collected from the soil cover above the buried waste.

- Waste Soil. Buried waste was encountered from approximately 5-10 feet below the ground surface at the transfer station. Plate 3 shows the approximate extent of the buried waste. Four waste soil samples were collected from GP-1 (SO-W14-NP), GP-2 (SO-W13-NP), GP-3 (SO-W15-NP) and GP-5 (SO-W16-NP) using a Geoprobe® rig as described above. Waste samples were collected over a 4-foot interval between 5 and 10 feet below the ground surface in GP-2, GP-3 and GP-5. The waste sample from GP-1 was collected from 1-5 feet below the ground surface.

- Subsurface Soil. One subsurface soil sample (SSO-01-NP) was collected outside the buried waste area from GP-4, from a depth of 1-5 feet below the ground surface.

A7.2 Quality Assurance/Quality Control Samples

The following equipment rinsate, field duplicate, and MS/MSD samples were collected during the surface and subsurface sampling conducted with the Geoprobe® rig at the transfer station (Nunes Property) :

A7.2.1 Equipment Rinsates

- SO-ER01 collected after SO-033-NP

A7.2.2 Field Duplicates

- SSO-FD01 duplicate of SSO-01-NP

A7.2.3 MS/MSD

- SSO-01-NP

A8. Debris Fields Sampling

Two areas of extensive surface debris were identified in the Work Plan for soil sampling: Debris Fields 1-3 and Debris Field 4. Debris Fields 1-3 consist of piles of waste that were placed along an access corridor, approximately 50 feet wide, located adjacent to the P&W Railroad. They extend approximately 1,900 feet from Martin Street to the drainageway near MW-106 (Plate 5). Debris Field 4, located on the southeastern flank of the landfill (Plate 4), measures approximately 1 acre.

A8.1 Surface Waste Sampling

Composite soil samples were collected from the ground surface at the locations shown on Plates 4 and 5. Because these samples were collected close to or in direct contact with the surface debris, they were designated as waste soils (i.e., with the SO-W prefix). All of the composite surface waste samples were collected from the debris fields initially on August 26-27, 2003. However, the holding times for the extractable organics analyses on these samples were subsequently exceeded by the laboratory. Therefore, on September 20, 2003, composite samples from all debris fields were recollected from the same locations for extractable organics analyses only.

Shield personnel inspected and inventoried the debris fields to identify objects and areas of concern. David Newton of the USEPA accompanied Shield personnel and helped locate and identify specific areas of concern within Debris Fields 1-3 on August 25, 2003. The northernmost area (approximately 200 to 750 feet southeast of Martin Street) of Debris Fields 1-3 consists primarily of broken concrete pieces, asphalt, and soil. Observations and historical information provided by the USEPA suggest that this material originated from the closure and possible remediation of gasoline stations. Two composite samples (SO-W11-DF and SO-W12-DF) were collected from this material.

The remaining southeastern extent of Debris Fields 1-3, from approximately 750 to 2,100 feet south of Martin Street, consisted of large concrete slabs and railroad ties. Within this area, smaller areas of concern were identified for sampling. Composite samples were collected from areas that included a large stockpile of railroad ties (SO-W08-DF) and two areas containing drums (SO-W07-DF and SO-W10-DF). One additional composite sample (SO-W09-DF) was collected in the area of the stockpiled concrete slabs.

Debris types present in Debris Field 4 include large steel storage tanks, metal machinery, machine parts, and 55-gallon drums. Two composite surface soil/waste samples (SO-W05-DF and SO-W06-DF) were collected within Debris Field 4 from various areas of concern.

All composite soil samples were collected using a clean, decontaminated stainless-steel hand auger following the procedures listed in the FSP and Shield's SOP for the Collection of Surface Soil Samples (SEA-02-02 Surface Soil, Rev. #2). Specifically, each composite sample consisted of four separate surface samples from 0 to 1 foot below the ground surface. A headspace analysis was conducted on each sample using a PID. A soil sample was collected at a depth of 6 inches below the ground surface at the location showing the highest headspace reading for VOC analyses using a Terra-Core™ soil sampler. If the headspace analyses did not show VOCs in any soil sample, the location having the greatest visual evidence of potential contamination was selected for VOC sampling.

A8.2 Quality Assurance/Quality Control Samples

The following equipment rinsate, field duplicate, and MS/MSD samples were collected during the surface waste sampling conducted in the debris fields:

A8.2.1 Equipment Rinsates

- SO-ER03 collected after SO-W06-DF
- SO-ER04 replaces VOA SO-ER03

A8.2.2 Field Duplicates

- SO-FD04 duplicate of SO-W06-DF

A8.2.3 MS/MSD

- SO-W05-DF

A9. Surface Soil Sampling

The purpose of surface soil sampling was to characterize soil at the ground surface throughout OU2, in areas removed from potential source areas or waste, to evaluate the potential risk from exposure in areas that are not already targeted for remediation.

Surface soil sampling was conducted throughout OU2 during the period of August 18-28, 2003. Surface soil samples were collected using a stainless-steel hand auger or direct-push sampler and Terra-Core™ samplers.

All surface soil samples were collected in accordance with Shield's SOP for the Collection of Surface Soil Samples (SEA-02-02, Rev. #2) provided in the approved Work Plan. At the request of the oversight contractor, Metcalf & Eddy (M&E), the procedure was amended to include weighing the volatile organic analysis (VOA) sample vials prior to and following the collection of each soil sample to confirm that an adequate sample volume had been collected. In addition, the preservative in two VOA sample vials for each sample was changed from sodium bisulfate to deionized water (the preservative for the third vial remained methanol). Shield prepared an amended SOP on August 15, 2003 and submitted it to the EPA and M&E. This amended SOP is reproduced in Appendix B.

All surface soil sampling locations were flagged and later surveyed by GPS. All surface soil sampling locations are shown on Plates 2 through 5.

A9.1 Quinnville Wellfield (Background)

The Quinnville Wellfield area was selected by the USEPA and designated in the approved Work Plan as the location for collecting background surface soil samples. The purpose of collecting these soil samples was to establish background concentrations of the chemicals of potential concern in the surface soil from an area that was least likely affected by industrial/commercial activities within OU1 and/or OU2.

On August 18, 2003, five surface soil samples (SO-001-BG through SO-005-BG) were collected from the Quinnville Wellfield area at the locations shown on Plate 5, in accordance with the Shield SOP SEA-02-02 referenced above.

A9.2 Landfill

During the period of August 21-22, 26 and 28, 2003, 13 surface soil samples (SO-019-LF through SO-030-LF and SO-032-LF) were collected at the toe of the landfill adjacent to the Blackstone River. All samples were collected in accordance with Shield's SOP SEA-02-02.

Sample SO-031-LF was collected on August 26, 2003; therefore, it was part of a sample delivery group (SDG) separate from those samples collected on August 21-22, 2003. The MS/MSD sample that should have been collected with SO-031-LF as a separate SDG was inadvertently omitted. Therefore, a second surface soil sample (SO-032-LF) with the accompanying MS/MSD was collected at the same location as SO-031-LF on August 28, 2003 and assigned a new sample identification number to avoid confusion at the laboratory.

The purpose of collecting surface soil samples at the toe of the landfill was to identify the surface exposure risk in areas that had no underlying waste and might not be covered by a landfill cover under the presumptive remedy. It should be noted, however, that based upon the test trenching and geophysical results, four of the 14 surface soil samples (SO-018-LF, SO-019-LF, SO-021-LF, and SO-022-LF) collected at the toe of the landfill appear to have been collected from soils that cover waste material.

A9.3 Unnamed Island

During the period of August 19-20, 2003, Shield personnel collected eight surface soil samples (SO-007-UI and SO-010-UI through SO-016-UI) around the perimeter of the unnamed island and one surface soil sample (SO-006-UI) adjacent to the abandoned excavator. The samples were collected in accordance with Shield's SOP SEA-02-02 referenced above, at the locations shown on Plate 3.

The purpose of collecting the surface soil samples around the perimeter of the unnamed island was to characterize the potential surface exposure risk in areas that will not likely be affected by remedial actions at other locations on the island. SO-006-UI was the only surface soil sample collected from soils that overlie waste on the island.

A9.4 Transfer Station

On August 19 and 21, 2003, three surface soil samples (SO-008-NP, SO-009-NP, and SO-017-NP) were collected around the perimeter of the transfer station (Nunes Property). These samples were collected in accordance with Shield's SOP SEA-02-02 at the locations shown on Plate 3.

During the period of September 5-6, 2003, five additional surface soil samples (SO-033-NP through SO-037-NP) were collected at the transfer station using a track-mounted Geoprobe® direct-push rig as described above in Section A.7. The locations of these samples are also shown on Plate 3.

A9.5 Quality Assurance/Quality Control Samples

The following equipment rinsate, field duplicate, and MS/MSD samples were collected during the surface soil sampling event:

A9.5.1 Equipment Rinsates

- SO-ER01 collected after SO-003-BG
- SO-ER02 collected after SO-021-LF

A9.5.2 Field Duplicates

- SO-FD01 duplicate of SO-004-BG
- SO-FD03 duplicate of SO-022-LF

A9.5.3 MS/MSD

- SO-001-BG; S0-032-LF

A10. Geotechnical Testing

A10.1 Field Tests

Two types of geotechnical field tests were conducted during Phase 1A. Standard penetration tests (SPTs) were performed during the monitoring well installation activities described in Section A12 of this appendix. Cone penetration tests (CPTs) were performed on September 10, 2003 by CONETEC of West Berlin, New Jersey, under the supervision of Shield Engineering, Inc. (SEI) of Charlotte, North Carolina.

The SPTs were conducted in accordance with Shield's SOP for Standard Penetration Test and Split-Spoon Sampling of Soil (SEA-02-04 SPT, Rev #2). The data indicated very loose to medium-dense material in the subsurface. The blow count data are recorded on the Field Well Logs contained in Appendix E2.

The CPTs were performed as part of the slope stability analysis conducted by SEI in accordance with Section 3.0 of Shield's SOP for In Situ Geotechnical Testing of Strength Properties of Subsurface Materials (SEA-02-05 Strength Rev #2). CPTs were performed both in the waste mass and in native soil on the river bank at the toe of the landfill. Boring locations are shown on Plate 4. The CPT report is provided in Appendix F2.

The RI/FS Work Plan also included three in-situ pressure-meter tests to be performed in three hand augered shallow borings in the waste to evaluate the shear strength of the waste mass. After a visual evaluation of the landfill, the on-site geotechnical engineers from SEI concluded that the pressure-meter testing would not provide any additional information beyond the CPT testing that would aid in the slope stability analysis; therefore, these tests were not performed.

A10.2 Laboratory Tests

Samples were collected at all sediment sampling locations and at 5-foot intervals from each soil boring that was converted into a ground water monitoring well. These samples were submitted to SEI's geotechnical laboratory for grain size analysis (ASTM D-422). The Particle Size Distribution Reports are provided in Appendix F3. In the case of one sediment sample (SE-020-LF, from Landfill Pond B), the liquid and plastic limits were also determined by Method ASTM D-4318 to aid in soil classification.

In addition, composite subsurface soil samples were collected from eight monitoring well borings at a depth of 15 to 20 feet below the ground surface, and from one monitoring well boring (SEA-602B) at a depth of 30 to 35 feet below the ground surface. The samples were collected directly from the auger and composited into a 5-gallon bucket. Besides grain size, these samples were analyzed for natural moisture content

(ASTM D-2216-90), specific gravity of soil solids (ASTM D-854), and maximum dry density by compaction (ASTM D698-91 B). The Compaction Test Reports and a data summary table are also provided in Appendix F3.

A11. Staff Gauge/Piezometer Installation

During the period of August 7-12, 2003, Shield personnel supervised the installation of 19 piezometers and combination staff gauge/piezometers at the locations shown on Plate 1. Shield subcontracted Geologic of Warwick, Rhode Island, to provide the materials and labor for installation. The piezometers were constructed of 1-inch galvanized steel pipe connected by threaded couplings to screened sections constructed of 0.010-inch wire wrap screens. The screened sections were 2 feet long in PZ-01 through PZ-06, and 3 feet long in the remaining piezometers (PZ-07 through PZ-19). Table 4 summarizes the construction information for the piezometers and the combination staff gauge/piezometers installed during Phase 1A.

Most of the piezometers and combination staff gauge/piezometers were installed by hand using a slide hammer, and a few were installed with a Geoprobe® rig. The combination staff gauge/piezometers were driven into standing bodies of water, to depths of 3 to 7 feet below the bed of the water body, depending upon the resistance and the depth required to sufficiently anchor the pipe and screen. A few piezometers (PZ-08, PZ-16, PZ-17 and PZ-18) were driven on dry land at the unnamed island to supplement the potentiometric measuring network available for the site. These piezometers were driven 12 to 15 feet below the ground surface to make sure the screens intersected or were below the water table.

A12. Monitoring Well Installation and Development

During the period of September 15-21, 2003, one intermediate (SEA-602B) and eight shallow (SEA-601, SEA-602A, and SEA-603 through SEA-608) monitoring wells were installed within OU2. The shallow wells were installed to a depth of approximately 20 feet below the ground surface, and the intermediate well was installed to a depth of approximately 60 feet below the ground surface. Six wells, including the intermediate depth well, were installed within close proximity to and hydraulically downgradient of the buried waste at the landfill. Two shallow wells were installed within close proximity to and hydraulically downgradient of the buried waste encountered on the unnamed island.

In addition, one shallow well was installed in close proximity to and hydraulically downgradient of the buried waste encountered at the transfer station (Nunes Property).

A12.1 Well Installation

Monitoring wells SEA-601, SEA-602A, SEA-602B, SEA-604, and SEA-605 were drilled and installed by Geosearch, Inc., under subcontract to Geologic, using a truck-mounted Mobile B59 drill rig equipped with 4.25-inch-inside-diameter hollow-stem augers. Monitoring wells SEA-603, SEA-606, SEA-607, and SEA-608 were installed by Geologic using a track-mounted CMD55 drill rig equipped with 4.25-inch-inside-diameter hollow-stem augers. All wells were installed in accordance with Shield's SOP for Monitoring Well Installation (Unconsolidated Formations) Using Hollow-Stem Augers (SEA-03-01, Rev. #2).

SPTs and continuous split-spoon samples were collected at 2-foot intervals during the drilling of each monitoring well. The work was conducted in accordance with Shield's SOP for Standard Penetration Test and Split-Spoon Sampling of Soil (SEA-02-04 SPT, Rev #2). Soil samples were described in accordance with Shield's SOP for the Field Description of Soil Samples (SEA-02-01, Rev. #2). Soil descriptions, classifications, blow counts, PID readings, and recoveries are recorded on the Field Well Logs contained in Appendix E3.

All monitoring wells were installed in accordance with Shield's SOP for Monitoring Well Installation (Unconsolidated Formations) Using Hollow-Stem Augers (SEA-03-01, Rev. #2) with the following exceptions. The seal in each well consisted of hydrated, medium-pure bentonite chips rather than the 30% solid bentonite pellets specified in the SOP. Also, the grout used in monitoring well SEA-602B was a pure bentonite grout rather than a cement/bentonite mixture.

The monitoring well locations are shown on Plate 1. The monitoring well installation logs for the new wells are provided in Appendix E3. Construction details for the new and previously installed monitoring wells in OU2 are summarized in Table 5.

A12.2 Well Development

During the period of September 22-24, 2003, all of the new monitoring wells were developed using an electric submersible pump and disposable polyethylene tubing. The wells were developed in accordance with Shield's SOP for Monitoring Well Development (SEA-03-02, Rev #2) with the following exception: a separate surge block was not used prior to pumping; rather, the pump itself was used as a surging tool during the well development. Approximately 55-60 gallons of water were removed from each new well during the development procedures.

During the period of September 3-8 , 2003, all previously existing 2-inch-diameter monitoring wells that were scheduled to be sampled or hydraulically tested were redeveloped using the methods outlined above. Approximately 30-50 gallons of water were removed from the 2-inch-diameter wells during development. A peristaltic pump was used to develop the 1.5-inch-diameter wells between October 4 and 8, 2003. Approximately 5-10 gallons of water were removed from the 1.5-inch-diameter wells.

A12.3 Well Completions

Table 5 includes a column with a formation code (FM) established for each well, both existing and new. The purpose of these codes is to distinguish between the various hydrolithologic zones present in the water-bearing formations beneath the site for use in potentiometric analyses. The wells have been distinguished by FM as follows:

- SH The well screen is in unconsolidated glaciofluvial sediments, and the middle screen elevation is above 35 feet NGVD29.
- IN The well screen is in unconsolidated glaciofluvial sediments, and the middle screen elevation is between -10 and 35 feet NGVD29.
- DP The well screen is in unconsolidated glaciofluvial sediments, and the middle screen elevation is below -10 feet NGVD29.
- TL The well screen is in till just above bedrock.
- BR The well screen is in bedrock.

Of the nine wells installed by Shield, eight were installed in the SH zone and one (SEA-602B) was installed in the IN zone. None of the wells installed by Shield or other soil borings performed during the Phase 1A activities were drilled to refusal.

Four wells were installed by EA Engineering, Science and Technology, Inc. (EA) in June 2003, at locations along the northeastern boundary of the wetlands (MW-EA-1 through

MW-EA-4 on Plates 1 and 4). These wells were installed on behalf of Berkeley Commons/River Run Development (Plat 14 Lots 2 and4, and Plat 15 Lot 1 on Plate 1), referred to for the purpose of the RI/FS as the McNulty property. All four of these borings were drilled to bedrock, and they encountered little to no ground water above the bedrock. One well (MW-EA-1) was finished in the unconsolidated overburden just above bedrock, and three (MW-EA-2 through MW-EA-4) were installed in bedrock.

All available bedrock elevations for OU2 are summarized in Table 6. A bedrock elevation contour map was originally presented in Figures 3-10 in the site-wide RI report (CE-E, 1990), based on mapping of outcrops and geophysical (seismic) surveys performed in the 1980s, as well as subsurface boring information. A revised map, modified from the work originally presented in the CE-E report using the new data from the EA wells, is shown on Plate 6.

A13. Low-flow Ground Water Sampling

During the period of September 29-October 4, 2003, Shield sampled all of the newly installed wells and 19 existing wells located within OU2. The wells were purged and sampled in accordance with Shield's SOP for Low-flow Ground Water Sampling (SEA-04-02, Rev. #2) with one exception. When turbidity measurements dropped below 5 NTUs, the requirement of three successive readings within ±10% became increasingly difficult to achieve. Therefore, a field decision was made and communicated to on-site M&E representatives that sampling would begin once all water quality measurements had stabilized and three successive turbidity readings were less than 5 NTUs.

Two sampling teams used the following equipment for the low-flow ground water sampling event:

- QED® SamplePro® stainless-steel bladder pump with backpack controller and compressed CO_2 gas.
- One YSI® 6820/650 and one YSI® 600XL/650 multiparameter water quality meter, data logger, and flow-through cell.
- Lamotte® 2020 turbidimeter.
- Solinst® or Slope Indicator® water level indicator.

As directed by the above-referenced SOP for low-flow ground water sampling, water levels and water quality parameters were recorded approximately every 5 minutes on a Well Purging/Field Water Quality Measurements Form. Table 7 summarizes the last three readings from this form that were recorded during low-flow purging activities at each of the wells sampled during Phase 1A. Table 8 summarizes the final readings only and compares them to readings of temperature and specific conductance collected at each of the existing wells in May 2002. Also included in Table 8 are measurements of the TVOCs in wellhead vapor when the wells were first opened (collected in May 2002 and during the potentiometric survey on September 25, 2003).

A13.1 Quality Assurance/Quality Control Samples

The following equipment rinsate, field duplicate, and MS/MSD samples were collected during the low-flow ground water sampling event:

A13.1.1 Equipment Rinsates

- GW-ER02 collected after MW-B2
- GW-ER03 collected after SEA-602B

A13.1.2 Field Duplicates

- GW-FD02 duplicate of GW-005-WT (MW-110B)
- GW-FD03 duplicate of GW-026-UI (MW-608)

A13.1.3 MS/MSD

- GW-002-LF; GW-023-LF

A14. Well Hydraulic Tests

A14.1 General

Between October 2 and 8, 2003, Shield performed single well hydraulic tests on 24 wells at the site. The wells selected for testing included the nine new wells (SEA-601 through SEA-608) and 15 existing wells chosen to represent the various formations present vertically beneath the site. All of the wells selected were developed prior to testing. The wells designated for both ground water sampling and hydraulic testing were also sampled prior to testing.

Due to the relatively high permeabilities of the formations to be tested, particularly the shallow overburden (glaciofluvial) materials, the single well pump-and-recovery test, as described in SOP SEA-05-02(Rev #2), was selected for testing the wells at this site. This test consists of pumping a well for a known period of time at a constant (or near-constant) rate and measuring the drawdown during the pumping phase and then residual drawdown during the recovery phase. The recovery-phase data are used to estimate the transmissivity of the formation in the vicinity of the well screen. Transmissivity is the capacity of a porous medium to transmit a given rate of water flow through a unit cross-sectional area of the medium. Hydraulic conductivity (a measure of permeability in water-saturated formations) is then estimated by dividing the calculated value of transmissivity by the length of saturated screen in the well.

In high-permeability formations, the water level “noise” or wave action that occurs when introducing a slug or turning on a pump can overwhelm the formation response, especially during short tests. The advantage of a pump-and-recovery test over a short-duration slug test is that the drawdown response is maintained for a longer period of time and allowed to equilibrate prior to initiating the recovery response by turning off the pump. However, even in this type of test, the recovery response in a high-permeability formation may still be almost too fast to distinguish from wave “noise” and to measure accurately.

A14.2 Field Methods

At the Peterson/Puritan OU2 site, Shield used a pressure transducer and data logger to measure response more accurately and quickly than manual measurements would allow. Specifically, the water level response was measured using an In-Situ, Inc. MiniTroll Pro® transducer with a 30-psi range pressure sensor and a temperature sensor linked to a datalogger set to record data on a logarithmic frequency. The datalogger was connected to a Compaq® hand-held computer for field use. Shield used a Whale® brand submersible pump operated on direct current (DC) power, capable of pumping 1.3 to 1.8 gallons per minute (gpm) to create drawdown during the tests in the 2-inch-diameter wells. In the 1.5-inch-diameter deeper wells, Shield used a Solinst® Model 410 peristaltic pump with a maximum flow rate of about 0.25 gpm.

Prior to each test, the depth to water in the well was measured using an electronic water level indicator. The pump intake was lowered to a level about 10 feet below the static water level (SWL) and tied off. The pressure transducer was then lowered to a depth of 3 to 6 feet below SWL, and the cable was strapped to the well casing so that the transducer would not move during the test. The depth of water over the transducer was monitored using the hand-held computer connected to the datalogger to check that the water level had stabilized. The datalogger was programmed to record the test in two logarithmic segments: one starting just before the pump was turned on, and one starting just before the pump was turned off. Upon completion of the test, the test data were transferred from the datalogger to the hand-held computer (and later to the field laptop computer). A final depth to water measurement was taken using the water level indicator after the test was ended, and the equipment was then removed from the well.

Initially, the tests were set to pump and record drawdown for 30 minutes and to record recovery response for 15 minutes after the pump was turned off. After the first few tests were run, it was observed that near equilibrium was being reached in both phases in just a few minutes. After that, the pumping period was shortened to 20 minutes and the recovery period was shortened to 5 to 10 minutes.

A14.3 Data Analysis

The data collected during the Phase 1A well testing activities are summarized by well in the graphs and tables in Appendix F1. For each well, there is a graph of drawdown and recovery over time on an arithmetic time scale, and the average pumping rate during the drawdown phase is shown on that graph. The next graph is a semilogarithmic graph of residual drawdown during recovery (on the arithmetic scale) versus t/t' (on the logarithmic scale). The value "t" is the time (in minutes) since pumping began; "t'" is the time (in minutes) since pumping ended. All of the measured data are summarized on the table following the graphs.

Upon the completion of testing, a review of the data indicated that in some cases, a certain amount of "drift" occurred in the measurements made with the transducer. In other words, even when the starting and ending water level elevations measured with the water level indicator were the same, the elevations reported by the transducer were higher at the end of the test than at the beginning. This effect was most pronounced in the test performed at SEA-604 between 7:55 a.m. and 8:25 a.m. on October 7, 2003. The depths to water measured at the beginning and end of the test with a water level indicator were 10.82 and 10.81 feet below the measuring point, respectively. Yet, the column of water measured by the transducer had a starting height of 3.112 feet and an ending height of 3.755 feet (a difference of 0.643 feet). Inquiries made to the manufacturer (In-Situ, Inc.) indicated this “drift” was most likely related to the equilibration of the transducer with the water temperature in a well. The effect was greatest in the early morning, when the transducer was very cold compared to the well water. According to the manufacturer, up to 60 minutes could be required for complete equilibration, but 10 to 20 minutes is usually sufficient. Therefore, for the tests performed at this site, the transducer could be assumed to have reached equilibrium by the end of the pumping period. In the data analysis, the elevation measured by the transducer at the end of the test was assumed to correspond to the SWL, and the residual drawdown calculated from that elevation was used in the analysis. This approach served to minimize the effect introduced by transducer drift in the results, since it is the residual drawdown (or recovery) curve measured at the end of pumping that is used to derive the estimate of transmissivity.

Transmissivity is estimated from a straight line fit to the recovery data on the semilogarithmic graph, as shown in the test graphs in Appendix F1. The Theis recovery formula is used to calculate transmissivity (T) as follows:

$$T = (2.3Q) / (4 * \pi * \Delta s)$$

Where:

T = transmissivity (cfd/ft)
Q = pumping rate (cfd)
Δs = drawdown over one log cycle, from the straight-line (ft)

The estimated value of T (in cubic feet per day per foot, or cfd/ft) is shown on the summary sheet provided for each well test. Also provided on that sheet are the length of saturated screen (b, in feet) and the estimated value of hydraulic conductivity (K, reported in feet per day or fpd, and centimeters per second, or cm/sec), calculated by dividing T by b.

The pumping rate and drawdown measured in a test can also be used to estimate a specific capacity (SC) for each well. The SC, which is reported in gallons per minute per foot or gpm/ft, is the pumping rate per foot of drawdown, and it can be roughly correlated to T as discussed in the following section.

A14.4 Results

The test results are summarized on the table at the front of Appendix F1, where they have been organized according to the formation tested. The last column on the summary table lists the values of SC estimated from the low-flow pumping data collected during ground water sampling. These values have been provided for comparison, and they show that the wells behaved similarly when they were pumped for sampling as they did when they were pumped for hydraulic testing. However, the SC values estimated from testing should be considered more reliable because the drawdown was greater and it was more precisely measured with a transducer during testing than with a water level indicator during sampling.

The two graphs immediately following the summary table show that there is a general correlation between SC and T. However, the relationship was found to be different for the wells having high SC values (greater than 5 gpm/ft) than for the wells with low SC (less than 5 gpm/ft). For high SC wells, including most of the wells finished in shallow and some in intermediate unconsolidated sediments, T can be estimated as T = 500 SC, where T is in cfd/ft and SC is in gpm/ft. For low SC wells, including wells finished in bedrock, till, and the deep unconsolidated sediments, T can be estimated as T = 50 SC.

For each formation tested, the maximum, minimum, and geometric mean of the test values are provided in the summary table for K and SC. The geometric mean is used because locally measured values of K have been shown to be log-normally distributed in natural formations (Freeze and Cherry, 1979).

Eight new wells (SEA-601, SEA-602A, and SEA 603- through SEA-608) and six existing wells (MW-108AA, MW-109AA, MW-110A, MW-111AA, P-7, and P-8) finished in the shallow, unconsolidated sediments (i.e., with a middle screen elevation above 35 feet NGVD29) were included in the testing. In these wells, SC ranged from 2 to 57 gpm/ft, and estimates of K ranged from 8 to 4,510 fpd, with a geometric mean of 251 fpd ($8.8x10^{-2}$ cm/sec). These values are on the high end of permeability in naturally occurring formations, and they are characteristic of very well-sorted sand and gravel. The highest values of K (above 1,000 fpd) were measured in wells at the toe of the landfill on its west side (SEA-601, SEA-602A, SEA-603, and P-8), and in the shallow well on its northeastern flank (MW-108AA).

Three wells finished in the intermediate unconsolidated sediments (i.e., with a middle screen elevation between -10 and 35 ft NGVD29) were included in the testing: SEA-602B, MW-108A, and MW-111A. SC in these wells ranged from 1 to 27 gm/ft, and estimates of K ranged from 7 to 761 fpd, with a geometric mean of 114 fpd (4.0×10^{-2} cm/sec). This is about half the permeability of the shallow sediments, although still very high.

Two wells each were tested in the deep unconsolidated sediments (MW-108B and MW-109A) and in the till (MW-109B and MW-110B), yielding similar results: SC ranged from 0.8 to 2.4 gpm/ft and K ranged from 2 to 8 fpd. The geometric means were 4.0 fpd (1.5×10^{-3} cm/sec) and 7.7 fpd (2.7×10^{-3} cm/sec) for the deep unconsolidated sediments and the till, respectively. These values are characteristic of silty sand and very fine, well-sorted sand.

Three wells finished in bedrock were included in the testing: MW-108C, MW-109C, and MW-110C. SC in these three wells ranged from 0.04 to 0.9 gpm/ft, and K ranged from 0.09 to 1.7 fpd, with a geometric mean of 0.4 fpd (1.4×10^{-4} cm/sec). This is an order of magnitude lower than the permeability of the deep sediments and till that directly overlie bedrock, and three orders of magnitude lower than the shallow unconsolidated sediments. According to Freeze and Cherry (1979), this range is typical for fractured igneous and metamorphic rocks.

A15. Climatic Data

Daily climatic data for Lincoln, Rhode Island, available from the National Weather Service (NWS) in Taunton, Massachusetts, are provided in Appendix G1 (Table G1-1) for the period of the Phase 1A fieldwork (August-October 2003). Daily climatic data recorded at the site are provided for comparison in Table G1-2 (Appendix G1). The on-site rain gauge did not provide reliable data; therefore, the precipitation recorded by the NWS at Lincoln, Rhode Island, will be used in the Phase 1A studies for OU2.

A16. Potentiometric Surveys

Potentiometric surveys consist of water level measurements made in wells, piezometers, and staff gauges during a concentrated period of time to evaluate the distribution of water level elevations in surface water and ground water at the site.

Shield has conducted four potentiometric surveys at the Peterson/Puritan OU2 site: one during the Pre-Phase 1 Preparatory Assessment (May 5-7, 2002), and three during the Phase 1A fieldwork (August 14-15, 2003; August 25-27, 2003; and September 25, 2003). The first (May 2002) included a potentiometric survey of the existing wells in OU2 only. The two surveys performed in August 2003 included the existing wells and the new piezometers and combination staff gauge/piezometers installed during Phase 1A. The last survey (September 2003) included the new wells installed during Phase 1A by Shield, the four wells installed on the McNulty property (MW-EA-1 through MW-EA-4), all existing wells, the piezometers, the combination staff gauge/piezometers, and the two headwalls. This last survey was performed concurrently with a potentiometric survey performed by ENSR in OU1.

Potentiometric measurements were made in accordance with SOP SEA-04-01 (Water Level Gauge, Rev. #2). At the combination piezometer/staff gauges installed in standing surface water, water level measurements were made from the top of casing both inside and outside the pipe to measure shallow ground water and surface water levels, respectively.

The data collected during the potentiometric surveys are provided by date in Appendix G2 (Tables G2-1 through G2-5). Several instruments were used to measure the water levels in the wells. In May 2002, the water levels in the wells were measured with a Solinst® Reelogger multiparameter data logging system, in combination with SC surveys in the existing wells. In Phase 1A, three different electronic water level indicators (WLIs) were used at various times: two Solinst® indicators (both 200 feet long) and one Slope indicator (150 feet long). When compared to each other, the measurements made in a single well by different instruments were 0.02 to 0.11 feet apart, typically on the order of 0.05 feet. For each survey, all measurements were corrected to a single instrument (the Slope indicator) as part of the initial data compilation.

During the September 25, 2003 potentiometric survey, a reading of TVOCs in wellhead vapor was collected at each well immediately after it was opened. The reading was taken with a Photovac® MicroFID®, calibrated to 50 parts per million (ppm) methane, by sampling vapor just inside the top of the casing immediately after the well cap was removed. The readings collected are summarized in Table 8.

For the September 25, 2003 survey, the water level data collected by Shield were compared to data collected by ENSR in a few wells located in the zone of overlap between the two operable units (Table G2-6 in Appendix G2). The depth to water measurements made in 10 wells by the two companies had differences of 0.01 to 0.18 feet; these differences are within the expected range given the different instruments used, the different times of day, and the possibly different measuring points on uneven top-of-casing surfaces. For the same wells, the top-of-casing elevations surveyed for the OU2 RI/FS were within 0.30 feet of the top-of-casing elevations used by ENSR for the OU1 studies, except for three wells in the Quinnville Wellfield area (GZ-1-1, GZ-1-4, and MW-A2). Differences in the top-of-casing elevations for these three wells ranged from 0.9 to 2.2 feet. Since these wells had not been surveyed for several years, ENSR decided to adopt the more recently surveyed (OU2) elevations for these wells. With this adjustment made, the water level elevations calculated for the overlap wells by the OU1 and OU2 teams were found to be within 0.33 feet of one another.

As discussed in Section A12 above, several wells at the site have been installed in clusters so that they monitor different vertical zones. An FM has been developed to distinguish the various hydrolithologic zones beneath the site. The FM for each well is listed on Table 5. The water level data in Appendix G2 have been keyed by well according to the FM. Only the data for the surface water (SW) and shallow unconsolidated (SH) zones have been used to map the potentiometric surface. Plates 7 and 8 are potentiometric surface contour maps based upon the water level elevations measured in these two zones on August 25-27 and September 25, respectively.

In addition to the potentiometric surveys performed in concentrated periods of time, water level readings were taken almost daily in one piezometer, PZ-01, located near the landfill's south gate and the MW-109 well cluster. The purpose of taking these readings was to monitor the stage in the Blackstone River over the period of the Phase 1A fieldwork. The PZ-01 data are also provided in Appendix G2 (Table G2-7).

A17. Surface Water Flow Measurements

A17.1 Blackstone River - General

Historical and real-time flow data for the Blackstone River are available from the U.S. Geological Survey (USGS). A summary of the historical data for this station is provided in Appendix G3.1. Appendix G3.2 includes a table (Table G3.2-1) and a graph (Figure

G3.2-1) showing the discharge at Woonsocket during the Phase 1A fieldwork (August-October 2003) compared to the 74-year mean of daily discharge for the same period. Mean monthly discharges at Woonsocket are 305, 322, and 423 cubic feet per second (cfs) in August, September and October, respectively. The graph in Figure G3.2-1 shows that three high-discharge events (over 500 cfs) occurred during the Phase 1A fieldwork period. The most notable event occurred in early August 2003, just before the start of sampling on August 14 (maximum daily mean discharge was 1,330 cfs on August 9). These precipitation-related events were followed by periods of receding flow, during which the discharge at Woonsocket reached apparent baseflow rates of about 150 cfs.

The graphs in Figure G3.3-1 (Appendix G.3.3) illustrate the close correlation between river flow and precipitation events. The second graph also shows that the stage measurements made at the site, in the combination staff gauge/piezometer PZ-01, closely follow the discharge measurements recorded by the USGS at Woonsocket. This finding indicates that little delay or buffer exists between these two sections of the river. The graph in Figure G3.3-2 (Appendix G.3.3) shows the correlation between the stage at OU2 and the discharge at Woonsocket follows a straight-line fit on a semi-logarithmic graph. This graph is essentially a rating curve, allowing the stage at OU2 to be predicted for flows in the range of 150 to 600 cfs at Woonsocket.

A17.2 Blackstone River - On-site Measurements

Two surface water flow surveys were conducted at the Blackstone River at OU2 during Phase 1A: on August 15 and on September 26-27, 2003. The data from these surveys are summarized in Appendix G3.3.

In both surveys, river transects were established at each of the stations where flow was to be measured. The transect was marked by tying off a rope from bank to bank, perpendicular to the direction of the stream flow, and just above the water level. The rope was subdivided into stream segments that were approximately equal depending upon the width and bottom configuration of the stream. For each segment, the width and average depth of water were recorded to compute the cross-sectional area of flow for that segment. The flow was measured in the middle of each segment, using one of two instruments, as described below. The flow rate in each segment was computed by multiplying the average velocity for the segment by the cross-sectional area of flow. As shown on Table G3.3-1 (Appendix G3.3), the total flow at each transect was then computed as the sum of the flows through each segment.

Surface water flow measurement locations are shown on Plate 9. The river transects included in the surveys were BRF-01, BRF-02, BRF-03, and BRF-05-01/02. At BRF-01, on the upstream end of OU2 near P-6, the river was found to be about 125 feet wide and to have an average depth of about 2 feet, with a small segment dropping to a maximum depth of 4 to 5 feet (depending on stage). At BRF-02, near PZ-01 and MW-109, the river was found to be 95 feet wide and approximately 4 feet deep. At BRF-03, in the main channel north of the unnamed island, the river was only 59 feet wide, with a maximum depth of about 4.5 feet. Average velocities in these transects were found to vary from 0.2 to 3.3 feet per second (fps). At BRF-05-01 and BRF-05-02, located on either side of the smaller island (also unnamed) in the river near MW-106 on the upstream end of the landfill, the two sub-channels were shallower (average depth 1.1 feet) and velocities higher (up to 5.3 fps) and turbulent. No transects could be located opposite the landfill where the river channel is most modified by filling activities. Along this stretch, the river was found to be narrow, swift, and relatively deep (greater than 5 feet), making wading to collect stream flow measurements impossible.

At the time of the August 15, 2003 survey, the river was receding from a significant rain event and peak flow conditions (1,330 cfs) on August 9. The daily mean discharge at Woonsocket decreased from 512 to 372 cfs between August 14 and 16, and it was 419 cfs on August 15. One set of measurements was collected at transect BRF-1, and two sets were collected at BRF-2. The instrument used to measure velocity was a Global Water Flow Probe FP101 with a turbo-prop sensor, a digital readout, and velocity averaging capability. At each stream segment, the probe with the sensor was lowered and then raised through the vertical profile to obtain an average velocity. Because the probe does not rest on the bottom, it was difficult to hold it vertically (perpendicular); therefore, the measurements of average velocity made with this instrument are not believed to be as accurate as the flows measured in the later survey. Discounting the measurements made at BRF-01, the average flow at BRF-02 was estimated to be 394 cfs, about 6 percent lower than the mean discharge at Woonsocket that day (419 cfs).

When the river flow was surveyed on September 26-27, 2003, the river was again in a receding mode, with the daily mean discharge at Woonsocket dropping from a peak of 661 cfs on September 24 to 293 cfs on September 28. The daily mean discharges on

September 26 and 27 were 409 and 322, respectively. The transects surveyed were BRF-01, BRF-03, and BRF-05-01/02. The instrument used to measure velocity in this survey was the Marsh-McBirney, Inc. Flo-Mate® Model 2000, consisting of an EMI sensor mounted on a graduated, top-setting-wading rod and connected to a digital readout. The top-setting-wading rod can be rested on the river bottom and used to accurately position the sensor at the 0.2, 0.6, and 0.8 levels relative to the total water column depth. At each mid-segment location along a transect, velocity was measured at each of these three positions. At each position, three measurements were collected. The outlier was disregarded, and the other two were averaged to obtain the velocity for that position. The average velocity for the vertical profile at the location was obtained by first averaging the velocities at the 0.2 and 0.8 positions, and then averaging that value with the 0.6 position velocity.

On September 26, 2003, flow measurements were also made on the back channel that runs along the southwestern side of the unnamed island. The flow in the full channel was too slow to measure with the Flo-Mate®; therefore, measurements were made at the upstream (BRF-04-01) and downstream (BRF-04-02) ends of this channel. On the upstream end, only a very small stream of water (about 1.5 feet wide by 0.15 feet deep) was found to be flowing across the earthen levee that fords the river in this area, with a velocity of 0.3 fps, corresponding to a flow rate of about 0.07 cfs. On the downstream end, all the flow drained through the three culverts placed under the temporary earthen bridge installed for the Owens Corning (OC) removal (see Section A21 below). The combined flow through the three culverts was estimated to be about 1.66 cfs. It can be concluded that at base flow conditions, as long as the upstream levee remains intact, flow through the back channel around the unnamed island is very low (less than 2 cfs), and insignificant compared to the flow in the main channel around the northeastern shore of the unnamed island.

Based upon field observations, the river flow measurements made on September 26-27 were believed to be the most accurate, except for the estimate for the BRF-05-01/02 transects, where the flow was too turbulent to obtain accurate measurements. On September 26, 2003, the flow measured at BRF-01 was 514 cfs, which is about 25 percent greater than the daily mean discharge at Woonsocket (409 cfs). On September 27, 2003, the average flow between BRF-01 and BRF-03 was 389 percent higher than the reported discharge at Woonsocket (322 cfs). These observations of increased flow between Woonsocket and OU2 are consistent with the potentiometric surveys made in

August and September 2003, which showed gaining conditions all along the Blackstone River through OU2.

A17.3 Other Streams - On-site Measurements

In addition to the Blackstone River, surface water flow measurements were made at several other locations on September 26, 2003 as described below.

SWF-01 is the culvert discharging to the wetlands on the northeastern side, just west of the Panda Garden Restaurant ("Panda culvert"). At the time of the survey, a tree trunk had fallen across the culvert outlet. Although the flow could not be accurately measured, it was estimated to be very low (less than 0.02 cfs).

SWF-02 is located on Monastery Brook where it crosses the road just upstream of the wetlands. Flow in this stream was estimated using channel geometry and velocity measured with the Flo-Mate®. The estimates obtained were 0.35 cfs upstream of the culvert and 0.22 cfs downstream of the culvert.

SWF-03 is located on the creek that enters the wetlands about 200 feet west of Monastery Brook, at PZ-13. There is no culvert to drain this creek under the road; therefore, it crosses the road as sheet flow. The flow was estimated at various points where the stream crosses the road, based upon the geometry of the stream and the velocities measured using floating debris. The total flow was estimated to be on the order of 0.03 cfs.

SWF-04 is a point located on the channel that connects the main wetlands pond to the round pond at the southeastern end of the wetlands (thought to be a former municipal swimming hole). The wetlands were observed to be dry on both ends of this channel; therefore, no flow could be measured on September 26, 2003.

SWF-05 is located on the downstream end of the culvert that carries drainage from the sand and gravel pit and the pond at the northwestern end of the wetlands under the railroad and eventually to the river via a tributary channel located near MW-106. Headwall HW-01 is located on the upstream end of this culvert, but gravel obstructing the opening makes flow measurements impossible on the upstream end. The culvert discharges onto a steep slope, and an intake pipe for an old water pump bisects the flow of water draining out of the culvert. The flow at this location was estimated using channel geometry and velocity measurements made with the Flo-Mate® and using floating debris. The estimated flow was 0.27 cfs. The flow was also measured where the tributary channel drains into the river across an earthen levee, using channel geometry and velocity measured with the Flo-Mate®. The flow at this point was estimated to be 0.15 cfs.

One other drainage channel was inspected for flow: the drainageway parallel to the railroad tracks on the northeastern side, below headwall HW-02. Standing water was observed in this channel, but no flow.

In summary, only small flows were observed to be entering the wetlands during the survey performed on September 26, 2003: about 0.3 cfs from Monastery Brook, and less than 0.03 cfs each from the brook just west of Monastery Brook and from the Panda Culvert. The wetlands appeared to be drying out throughout the Phase 1A fieldwork period; on September 26, no surface drainage was observed exiting the wetlands to the south or the southeast. The drainageway on the north end of the wetlands, which also drains the ditch from the sand and gravel pit, was found to be carrying about 0.2 cfs into the Blackstone River. All of these flows are very small when compared to the flow in the Blackstone River, which was on the order of 500 cfs at the time of the survey and has a base flow of about 150 cfs at Woonsocket (and possibly more at the site).

A18. Surface Water and Sediment Sampling

Surface water and sediment samples were collected throughout OU2 during the period of August 28-September 10, 2003. Surface water and sediment sampling locations are shown on Plate 9.

The samples were collected in accordance with Shield's SOP for Surface Water and Sediment Sampling (SEA-06-03 SW Sed Sample, Rev. #3). At each location, field water quality parameters were measured first, using the YSI® datalogger and sonde placed approximately at the same vertical position as for surface water sample collection. The surface water sample was then collected, followed by sediment sample collection. In general, the surface water and sediment samples were taken at locations that had 2 feet of standing water. The exceptions were areas that had no surface water (ponds and wetlands) or that were mid-stream of the Blackstone River, or in the middle of a body of water (in the wetlands or in a pond). Surface water samples were collected at a depth of 40 percent of the water column, and sediment samples were collected from 0-1 foot below the bottom of the surface water body.

Surface water samples were collected with a horizontal flow-through sampler (Van Dorn sampler). Due to cross-contamination concerns and at the request of the on-site M&E representative, surface water samples for low-level arsenic analyses were not collected in the flow-through sampler. These samples were collected directly into certified-clean plastic containers and transferred into the preserved container for transport to the laboratory.

Sediment samples were collected with a stainless steel dredge or a stainless steel sediment auger. Sediment samples to be analyzed for VOCs were collected from the stainless steel auger using a Terra-Core™ sampler. The remaining sediment was homogenized and placed into the remaining containers. In areas were no standing water was observed, the sediment sample was collected using the surface soil sampling protocol. The sediment descriptions were recorded using the surface soil description protocol in SOP SEA-02-01. In this case, the sample identification number for the surface water sample was skipped so that sediment and surface water sample numbers would correspond to the same location. Two surface water samples were mislabeled (the label contained the wrong suffix): SW-020-WT and SW-021-WT. SW-020-WT was taken with SE-020-LF at Pond C. SW-021-WT was taken with SE-021-NP in the backwater channel on the Blackstone River at the Nunes Property.

The field analytical parameters measured in the surface water at the time of the Phase 1A sampling activities are summarized on Table 9, where they are compared to SC and temperature measurements made in May 2002.

A18.1 Blackstone River

Fourteen surface water and sediment samples (SW/SE-021-NP and SW/SE-022-BR through SW/SE-034-BR) were collected from the Blackstone River at the locations shown on Plate 9. The most upstream sample (SW/SE-022-BR) was collected upstream of Ashton Dam on September 5, 2003. This location was resampled three days later for VOCs in surface water only (SW-022A-BR), because no trip blank had been included with the first sample shipment.

All sediment samples in the Blackstone River were grab samples collected under 2 feet of water, with the exception of SE-023-BR and SE-026-BR. These were composite samples each consisting of four grab samples (A through D) collected along transects crossing the river at the locations shown on Plate 3. At the composite locations, the surface water sample was collected from the column of water overlying the first (A) sub-sample location in the composite.

Three samples collected along the Blackstone River were analyzed for additional (special) parameters: SW-026-BR immediately above the Pratt Dam (along with the duplicate of that sample, SW-FD-02), SW-030-BR near Pond B, and SW-033-BR near well P-5. These special parameters were dissolved metals, ammonia, nitrite, nitrate, orthophosphate, sulfate, hardness, biochemical oxygen demand (BOD), and fecal coliform.

A18.2 Wetlands

Ten surface water and sediment samples (SW/SE-009-WT through SW/SE-018-WT) were collected within or upgradient of the wetlands. One sampling location (SW/SE-015-WT) was located in the mouth of Monastery Brook where it enters the wetlands just below the culvert under the road. The wetland areas have been designated as WT-A for the old swimming pond at the southeastern end, WT-B for the area adjacent to the Panda Culvert, WT-C for the area adjacent to Monastery Brook, and WT-D for the area adjacent to the sand and gravel pit on the northwestern end.

SW/SE-009-WT is located adjacent to PZ-10 in the wetland area WT-A. It is the only sample collected in this area. Samples SW/SE-010-WT, SW/SE-011-WT, and SW/SE-013-WT were collected in the WT-B wetland area. SW/SE-010-WT was collected in the discharge area of the Panda Culvert. SW/SE-011-WT was collected in the center of the wetland and was designated as a special parameter location (sampled for the additional parameters dissolved metals, ammonia, nitrite, nitrate, orthophosphate, sulfate, hardness, BOD, and fecal coliform). SW/SE-013-WT was collected adjacent to PZ-11, along the railroad tracks.

Samples SW/SE-012-WT, SW/SE-014-WT, SW/SE-017-WT, and SE-018-WT were collected in the WT-C wetland area. SW/SE-012-WT is located on the northern end of the area. SW/SE-014-WT is located adjacent to PZ-13 at the discharge of the unnamed creek just north of Monastery Brook. SW/SE-017-WT is located adjacent to PZ-12 along the railroad tracks. SE-018-WT is located at the northern end of the WT-C area, adjacent to the railroad tracks. Additionally, SW/SE-015-WT was collected from Monastery Brook, below the culvert. SW/SE-016-WT was collected in the WT-D wetland area adjacent to PZ-15. It was the only sample taken in this area of the wetlands.

A18.3 Ponds

Nine surface water and nine sediment samples (SW/SE-001-UI through SW/SE-003-UI, SW/SE-005-UI through SW/SE-008-BR, SW/SE SW SE-019-LF and SW/SE-020-LF) were collected from Ponds A through F. One additional sediment sample (SE-004-UI) was collected from a dry depression located next to the former abandoned excavator on the unnamed island ("Exc. Pond"). Surface water was not present within Pond B at the time of the sampling; therefore, only a sediment sample (SE-019-LF) was collected. All sediment samples collected were grab samples with the exception of SE-008-BR (collected from Pond F behind Pratt Dam). This composite sample consisted of four grab samples collected from each corner of the pond.

At Pond A, four samples were collected across the pond. SW/SE-003-UI was collected adjacent to PZ-09. SW/SE-006-UI was collected on the east bank, and SW/SE-005-UI was collected on the west bank. SW/SE-002-UI was collected from the center of the pond by boat. SW/SE-002-UI was designated as a special parameter location where sample containers were filled for the analysis of the additional surface water parameters (dissolved metals, ammonia, nitrite, nitrate, orthophosphate, sulfate, hardness, BOD, and fecal coliform).

A18.4 Quality Assurance/Quality Control Samples

The following equipment rinsate, field duplicate, and MS/MSD samples were collected during the surface water and sediment sampling event:

A18.4.1 Equipment Rinsates

Since the collection procedure for the low-level arsenic samples was changed from collection in the flow-through sampler to collection in a disposable, clean bottle, only SW-ER01 was sampled for low-level arsenic. None of the equipment rinsate samples was analyzed for the special parameters.

- SE-ER01 collected after SE-06-UI
- SE-ER02 collected after SE-028-BR
- SE-ER03 collected after SE-032-BR
- SW-ER01 collected after SW-02-UI
- SW-ER02 collected after SW-028-BR
- SW-ER03 collected after SW-033-BR

A18.4.2 Field Duplicates

- SE-FD01 duplicate of SE-003-UI
- SE-FD02 duplicate of SE-026-BR
- SE-FD03 duplicate of SE-029-BR
- SW-FD01 duplicate of SW-003-UI
- SW-FD02 duplicate of SW-026-BR which included special parameters
- SW-FD03 duplicate of SW-029-BR

A18.4.3 MS/MSD

- SE-001-UI; SE-028-BR; SE-030-BR
- SW-001-UI; SW-028-BR; SW-030-BR which included special parameters.

A19. Air Sampling - Landfill Vents

On October 7, 2003, three of five vents located at the top of the landfill were sampled in accordance with Shield's SOP for Air or Emission Sampling Using Canisters (SEA-08-01 Air Emission Canisters, Rev #2). An air sample and duplicate (AR-001-LF and AR-FD1) were collected from Vent #1. Air samples were also collected from Vent #2 (AR-003-LF) and Vent #5 (AR-002-LF). The locations of the air vents were surveyed by GPS and are shown on Plate 4.

Prior to sampling, each landfill vent was inspected and screened for VOCs using an FID. Landfill Vent #1 had an FID reading of 149.5 ppm. Vents #2 and #5 had readings of 500 ppm and 1,300 ppm, respectively. Vents #3 and #4 had negligible VOC readings and appeared to have been damaged or to have collapsed, so that the opening had been backfilled.

All air sampling equipment was decontaminated prior to use, and clean containers were obtained from the Severn-Trent Services, Inc. laboratory (STL) in Los Angeles, California. A rubber cap with a sampling port was placed on each vent sampled. A plastic fitting was used to split the Tygon® tubing, allowing for simultaneous sample collection into a Summa® and a Silco® canister. The initial and final vacuum readings from each canister were gauged and recorded on the Canister Field Data Record provided by the laboratory.

A20. Sample Handling and Laboratory Analysis

Air sample handling is described in the previous section. For all other media, after collecting samples into the appropriate containers, Shield applied or checked the sample label to make sure it was complete and accurate, placed each sample container into a zippered polyethylene bag, and placed the containers in a cooler with ice for storage and eventual transport back to the field trailer. At the field trailer, at the end of each sampling day, the coolers were checked to make sure that a field blank was included in all coolers containing samples to be analyzed for VOCs. A temperature blank was added to each cooler, ice was added to each cooler as necessary, and chain-of-custody forms were completed for each cooler.

Most sample analyses for the Phase 1A activities were performed by Mitkem of Warwick, Rhode Island. Due to the proximity of the site to the laboratory, the sample coolers were either picked up at Shield's field trailer by Mitkem, or they were delivered to Mitkem by Shield personnel. Mitkem subcontracted selected analyses to other labs, specifically: selected parameters (BOD and fecal coliform) in selected surface water samples, which were subcontracted to Rhode Island Analytical of Warwick, Rhode Island; and the low-level arsenic analyses in aqueous media, which were subcontracted to Brooks-Rand LLC of Seattle, Washington. Once the samples were delivered to Mitkem in Warwick, Rhode Island. Mitkem took responsibility for keeping the samples chilled and for delivering or shipping the appropriate sample aliquots to the subcontracted laboratories. A total of 17 SDGs containing environmental samples were analyzed by Mitkem and its subcontractors, as well as one batch containing two samples for characterization of the IDW. The environmental samples were analyzed by contract laboratory program (CLP) methods and modified CLP methods (as specified in the QAPP) for VOCs, semivolatile organic compounds (SVOCs) including polynuclear aromatic hydrocarbons (PAHs), pesticides and polychlorinated biphenyls (PCBs), metals and cyanide, and selected additional parameters: chloride in surface water and ground water; total organic carbon (TOC) in surface water and special parameters (dissolved metals, ammonia, nitrite, nitrate, orthophosphate, sulfate, hardness, BOD and fecal coliform) in selected surface water samples; and total combustible organics (TCO) and TOC in sediments and subsurface soils.

As described in the previous section, four air samples collected from the landfill vents were shipped to STL in Los Angeles, California, for analysis. The samples collected for geotechnical testing were shipped to SEI in Charlotte, North Carolina. They included 36 sediment samples, 23 subsurface soil samples from monitoring well borings, and 5 subsurface soil and waste soil samples from the Geoprobe® borings at the transfer station (one of which, SO-W15-NP, was not analyzed because it contained only waste materials).

The tables in Appendix H provide reference lists of the samples collected and analyses performed during Phase 1A. The data validation memos prepared by the Data Validation Team for each of the Mitkem SDGs are provided in Appendix I. The final analytical results are summarized by matrix and analytical group in the tables in Appendix J. The laboratory analytical data package reports (Appendix K) are reproduced on CD-ROM at the end of this report.

A21. Concurrent Site Activities

The Peterson/Puritan site is an active industrial area adjacent to medium-density residential areas. Due to the size and nature of the site, it is not possible to track all the events that could have significantly affected the data collection activities during the Phase 1A fieldwork. The following paragraphs describe the most notable events that came to the attention of Shield personnel during the fieldwork period from August through October 2003.

Upon mobilization, it was noted that several properties had changed use between the times of work plan preparation and implementation. The transfer station property was sold by the Nunes family, and it had been cleared of most debris. This property apparently is intended to be used in the future as a waste transfer station. The McNulty properties (Plate 14 Lots 2 and 4, and Plat 15 Lot 1) are currently being developed for residential use: blasting of rock outcrops was occurring on the northern end of these properties, whereas residential construction was already occurring on the southeastern end.

During the duration of the Phase 1A field activities, representatives of Owens Corning (OC) were present at the unnamed island and a portion of the transfer station for the removal of a small number of waste fiberglass rolls. During this period, OC representatives constructed a gravel road, including a temporary bridge with culverts, from Pratt Dam to the fiberglass burial area on the island. An investigation was performed in August (Arcadis G&M, Inc., 2003) and the waste of concern was removed in late October 2003. During that period, an abandoned excavator was also removed from the island by the Rhode Island Department of Environmental Management (RIDEM).

During the week of August 11, 2003, the P&W Railroad staged large bundles of new railroad ties (approximately 20 ties per bundle) in the area between the railroad tracks and the wetlands. The new ties had a strong creosote odor and were visibly oily. P&W began replacing the ties and leveling the tracks during the following week. The old ties were placed in the area between the tracks and the wetlands, and they remained on the site until the end of the Phase 1A field activities in October 2003; they may currently remain on the site.

On October 2, 2003, a spill of 2 million gallons of raw (untreated) sewage discharged into the Blackstone River from a wastewater treatment plant upstream of the site near Worcester, Massachusetts. At that time, all of the surface water and sediment sampling activities for Phase 1A had been completed. Ground water sampling activities continued until October 4, 2003, but news accounts indicated that the effects of the sewage spill had not yet reached the section of the Blackstone River in Cumberland and Lincoln as of that date.

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Appendix B

Appendix B Supplements and Revisions to the SOPs

B Supplements and Revisions to the SOPs

After the RI/FS Work Plan was finalized and approved by the USEPA on July 1, 2003, a few additions and changes to the SOPs established in the FSP and QAPP were initiated by Shield, Shield's subcontractors, and M&E (the oversight contractor for USEPA). In each case, these additions or changes were communicated to M&E and the USEPA, verbally in the field and/or by e-mail. This appendix formally documents the supplements and revisions to the RI/FS Work Plan made after the approval date of July 1, 2003, and it provides the rationales for the changes. As appropriate, these changes will be incorporated into the Work Plan supplements developed by Shield for future fieldwork at the Peterson/Puritan OU2 site.

B1. Field SOPs

B1.1 SOP for Conducting EMI Survey

At Shield's request, Weston Geophysical Engineers prepared an SOP for Conducting an EMI Survey Using a Geophex® GEM-2 Conductivity Meter, dated August 4, 2003. This SOP was transmitted to the USEPA by e-mail on August 8, 2003, and it is provided at the end of this appendix.

B1.2 Alternative Field Preservation for VOC Analyses in Solid Samples

In early August 2003, M&E and the USEPA asked Shield to amend the SOPs for handling and preservation of solid samples to be analyzed for VOCs, to incorporate one of the alternative preservation procedures allowable under EPA Method 5035. Shield prepared a Supplement to SOPs SEA-02-02 and SEA-06-03, which was transmitted to the USEPA on August 12, 2003. The signed copy of the supplement is provided at the end of this appendix.

B1.3 Turbidity End-Point During Low-flow Ground Water Sampling

During the low-flow purging for ground water sampling in September-October 2003, turbidity measurements were collected at 3- to 5-minute intervals. In most wells, turbidity levels dropped rapidly during the first 20 minutes of low-flow purging and would, in general, be below 10 NTUs when all other parameters had stabilized. However, when turbidity measurements dropped below 5 NTUs, the SOP (SEA-04-02) requirement of three successive readings within +/-10% (i.e., < 0.5 NTUs) became increasingly difficult to achieve. Therefore, a field decision was made to begin sampling if all water quality measurements had stabilized and three successive turbidity readings were less than 5 NTUs.

B2. Laboratory SOPs

B2.1 QAPP Worksheet #9d

This standard QAPP worksheet, entitled Analytical Services Table (Fixed Lab Analyses), was included in previous drafts of the Work Plan, but it was inadvertently omitted from Appendix A of the QAPP in the Final Work Plan (June 2003). It was sent to the USEPA by e-mail on August 8, and it is provided at the end of this appendix.

B2.2 Correction to QAPP Section 2.5.3

Section 2.5.3 of the QAPP, entitled Special (Project-Specific) Operating Procedures, describes special sample preparatory and analytical procedures developed by Mitkem to meet special requirements and lowered the detection limits for this project. In early September 2003, Mitkem informed Shield that the third paragraph on Page 25 of the QAPP contained an error. This paragraph in the QAPP reads:

- For pesticides/PCBs in surface water and groundwater, the OLC03.2 method is modified to reduce the final extract volume to 2.5 mL instead of the normal 10 mL volume. This provides adjusted CQRLs a factor of 4 lower than the normal OLC03.2 CRQLs.

To correctly state the extract volumes, the paragraph should have read as follows (corrections underlined):

- For pesticides/PCBs in surface water and groundwater, the OLC03.2 method is modified to reduce the final extract volume to <u>0.5 mL</u> instead of the normal <u>2.0</u> mL volume. This provides adjusted CQRLs a factor of 4 lower than the normal OLC03.2 CRQLs.

B2.3 Change in Chloride Method

In early September 2003, prior to performing any chloride analyses for this project, Mitkem informed Shield that the laboratory had acquired the equipment to perform the automated ferrocyanide method for chloride, EPA 325.2, and that it would like to change from the method specified in the QAPP (Standard Method 4500-Cl-B) to this method. When contacted by Mitkem, neither the USEPA nor the M&E representative expressed any reservations; therefore, Shield authorized the change. E-mail correspondence between Mitkem and representatives from the USEPA and M&E is reproduced at the end of this appendix.

B2.4 Change in Freeze-Drying Equipment and SpOP

A Special Operating Procedure (SpOP), entitled Special Operating Procedure for Freeze-drying High Moisture Solids Samples, was developed by Mitkem and included in Appendix E of the QAPP. This SpOP was written to use equipment owned by the University of Massachusetts in Boston (a Vertis Preservator 120/R403B).

To maintain better control over the freeze-drying process, Mitkem ultimately opted to buy a freeze-dryer for the laboratory facility in Warwick, Rhode Island, in early September 2003. The equipment purchased and used for this project was a Dura-Stop Stoppering Tray Dryer, manufactured by the FTS Life Science Division of FTS Systems, Inc.

The specific procedures followed in the freeze-drying process for the Phase 1A samples, using this equipment, were:

- Samples having 50 percent solids or less were placed in the unit.
- The temperature was decreased to -50 degrees C.
- After 60 minutes at -50 degrees C, a vacuum was applied. Vacuum (pressure) in the unit was reduced to approximately 40 milli-Torr.
- The samples were left in these conditions for 6 days to remove water (from October 7 to October 13, 2003).
- The percent solids of each sample was tested again after removal from the unit.

B2.5 Screening of Sediment Samples for PAH-SIM Analysis

An SpOP, entitled Special Operating Procedure for Rapid Screening of Solid Samples to be Analyzed for Semivolatile Organic Compounds, was developed by Mitkem and included in Appendix E of the QAPP.

In early September 2003, Mitkem informed Shield that the laboratory would perform the full OLM analysis for SVOCs on all sediment samples, rather than the rapid screening analysis. Mitkem felt this would be more effective for selecting the samples for low-level polynuclear aromatic hydrocarbon (PAH) analysis by selective ion monitoring (SIM). In the meantime, an aliquot of each sample was kept frozen and reserved for possible SIM analysis.

By September 24, 2003, the results of the full SVOC analysis were available. Mitkem contacted Shield and the USEPA at that time to develop an acceptable "decision tree" process for selecting samples for low-level PAH analysis. Representatives from the USEPA and M&E were provided with a draft memorandum for review and revisions. That review occurred by e-mail and through telephone conversations during the period of September 25-30, 2003. The memorandum, finalized by Mitkem after a review by the USEPA, was provided to Shield on October 31, 2003, and was attached to the project Status Report sent to the USEPA by Shield on November 1, 2003. A copy of that memorandum is provided at the end of this appendix.

Standard Operating Procedure (SOP) For Conducting an Electromagnetic Induction (EMI) Survey Using a Geophex GEM-2 Conductivity Meter

Prepared for
SHIELD ENVIRONMENTAL ASSOCIATES, INC.

Weston Geophysical
ENGINEERS
a Geophex company

325 West Main Street
Northborough, Massachusetts 01532
Phone (508) 393-4800
Fax (508) 393-7674

1.0 Application

This standard operating procedure (SOP) is provided as a guide for conducting a surface geophysical electromagnetic induction (EMI) survey using a Geophex GEM-2 Conductivity Meter. A surface EMI survey can be conducted to locate buried materials or anomalies and/or to identify ground water plumes with elevated electrical conductivity characteristics.

1.0 Equipment and Supplies

The following equipment and supplies will be available for conducting an EMI survey:

- Project Scope of Work and Health and Safety Plan (HASP) as provided by SHIELD
- Geophex GEM-2 Conductivity Meter
- Personal protective equipment (PPE), as appropriate
- Field logbook
- Site map
- Camera
- Measuring tape(s)
- Global Positioning System (GPS) equipment
- Survey flags and other marking materials

2.0 Procedures

The following procedures will be adhered to when conducting an EMI survey:

1. The Scope of Work will be reviewed to determine survey parameters and location.

2. The required equipment will be assembled and tested in accordance with normal operating procedures.

3. The appropriate PPE will be donned. The appropriate level will be determined prior to arrival at the site.

4. Proposed EMI grid pattern traverses will be positioned by taped distance measurements relative to a pre-determined starting location relative to the toe of the slope of the landfill and further reference to roads, buildings, or other semipermanent features and the existing site coordinate system, if appropriate.

5. Bush cutting, if needed, will be performed by others before geophysical data collection to enable the field geophysicist to walk at a uniform pace.

6. Uniform (every 50-feet) traverse stations will be marked on the ground surface using chalk, spray paint, or labeled pin flags or stakes, as appropriate. At this time the individual traverse line spacing is determined to be 40-feet. It is anticpated that the traverse lines may be separated into 3 sections to facilitate stationing around the three sides of the landfill. The traverse stations will be determined with a fiberglass measuring tape or distance-measuring wheel, as appropriate. Traverse deviations (i.e., obstacles or traverse bends) will be noted in the field logbook or data sheet. Traverse orientations will be recorded in the field logbook or data sheet, or on a plan map (if available).

7. Site conditions will be observed for power lines or aboveground metal objects within approximately 20 feet of a survey traverse since they may adversely affect EMI conductivity measurements. Anomalies caused by buried metal objects within those regions may be difficult to distinguish from anomalies caused by aboveground objects or subsurface lines or utilities.

8. The Geophex GEM-2 instrument will be assembled and functionally checked in accordance with the manufacturer's instructions prior to a survey.

9. The instrument will be set to record data in the vertical dipole mode.

10. The instrument will be set to record both inphase and quadrature components of the EMI field data. The instrument will be configured to record each of these components at 4 separate transmitter frequencies. Typically, one at a very low frequency for magnetic susceptibility, and the other three to cover a wide range of frequencies (1,000 to 15,000 Hz).

11. The traverse will be walked at a steady pace with the instrument held approximately 3 feet above the ground. Data values are recorded at 0.2-second time intervals (approximately 1-foot distance intervals at an ordinary walking pace). The beginning and end of each traverse will be denoted as well as intermediate distance marks at periodic intervals appropriate to the survey scale.

12. A field logbook or data sheet will be maintained during each survey to record EMI traverse positions and nearby features such as monitoring wells, surface metal, or other field observations.

3.0 Quality Assurance/Quality Control (QA/QC)

The following QA/QC procedures will be adhered to:

1. The Geophex GEM-2 instrument is calibrated at the time of manufacture and does not require additional calibration. The instrument however can be tuned to a site-specific conductivity. The Geophex GEM-2 instrument is tuned at the start of each day by recording the effect of a ferrite rod placed over the receiving coil. The deviation of the quadrature and inphase measurement can then applied to the field data prior to final presentation of the data.

2. EMI data values are visible on a digital screen as the data are acquired. The operator will observe the values as they are acquired to confirm proper functioning of the EMI instrument.

3. Digitally recorded EMI data will be transferred in the field to a laptop computer for contouring or plotting. Draft EMI contour maps of each component as well as a sum of all the quadrature components and magnetic susceptibility are typically prepared on the site using Golden Software Surfer contouring program with a Kriging grid algorithm. These contour maps (if prepared) will be examined for EMI anomalies that resemble metallic objects, areas of elevated conductivity, or other conditions judged to be relevant to the client's survey objectives. A second geophysicist will check all preliminary EMI interpretations prior to determining final interpretations.

4.0 References

The selected references provide a background for Weston Geophysical normal operating procedures for land base EMI investigations. All references are available at the Geophex, Ltd. website (www.geophex.com) in the publications section.

Geophex, Ltd.; 2003, GEM-2 Operator's Manual.

I.J. Won, D.A. Keiswetter, G.R.A. Fields, and L.C. Sutton, 1996, GEM-2: a new multifrequency electromagnetic sensor, Jour. of Environmental and Engineering Geophysics, v. 1, No. 2, p. 129-138.

Haoping Huang and I.J. Won, 2001, Conductivity and susceptibility mapping using broadband electromagnetic sensors, Journal of Environmental and Engineering Geophysics, v. 5, Issue 4, p. 31-41.

SUPPLEMENT TO STANDARD OPERATING PROCEDURES SEA-02-02 AND SEA-06-03

Shield Environmental Associates, Inc.

Date: August 15, 2003

Prepared by: ______________________ Date: 8/21/03

Senior Geologist

Approved by: Barbara H. Jones Date: 8/22/03

Corporate QA Officer

Approved by: ______________________ Date: 8/25/03

President

1.0 Scope and Applicability

This standard operating procedure has been prepared as a supplement to Shield's Standard Operating Procedures SEA-02-02 (Collection of Surface Soil Samples) and SEA-06-03 (Surface Water and Sediment Sampling). It describes an alternative field and laboratory preservation procedure for soil and sediment samples collected for analysis of VOCs by EPA Method 5035. This procedure will be used for all surface soil, subsurface soil and sediment samples collected for VOC analysis in the Peterson/Puritan OU2 Phase 1A field effort.

2.0 Sampling and Preservation Procedures

To collect solid samples for analysis of volatile organic compounds (VOCs) by EPA Method 5035, field core samplers (En Novative Technologies, Inc. Terra Core™ samplers or equivalent) will be used to collect the VOC aliquots as relatively undisturbed sub-samples from within the larger mass of sampled material. The following procedures should be followed when using Terra Core™ samplers and field preservation:

1. Before collecting the samples, personnel will read and understand the instructions accompanying the samplers and sample containers.

2. At each sampling location, have ready three 40 milliliter (ml) glass VOA vials, prepared and pre-weighed in the laboratory, containing the following preservatives:

    1) One vial containing methanol (1 vial);
    2) Two vials containing VOC-free deionized water and small stir bars.

3. Using a calibrated field balance, weigh the VOA vials, and record the field weight. Discard any vials that are found to have lost more than 0.1 g of solvent (methanol or water) since they were weighed at the lab.

4. A new Terra Core™ (En Novative Technologies, Inc.) or equivalent sampler will be used to collect each soil core with minimal sample disturbance. For each sample, a total of three cores will be taken per location. All three cores should be taken as close as possible to the same location. The same sampler may be used for all aliquots from the same location unless/until it fails mechanically, in which case a new sampler will be used.

5. With the plunger seated in the handle, push the Terra Core™ sampler into freshly exposed soil until the sample chamber is filled (a filled chamber will deliver approximately 5 grams of soil).

6. Using a clean wipe, wipe all the excess soil or debris from the outside of the sampler, removing any excess soil extending past the mouth of the sampler (the soil plug should be flush with the mouth of the sampler).

7. Rotate the plunger that was seated in the handle top 90 degrees until it is aligned with the slots in the body. Open the first 40 ml VOA vial with preservative, place the mouth of the sampler into it, and extrude the sample by pushing the plunger down. Remove any soil or debris from the threads of the vial using a clean wipe, and quickly replace the cap so that the vial is securely closed.

8. Note: because the vials and preservatives are pre-weighed, it is important not to spill any preservative, or leave any excess soil adhered to the outside of the vial, or the accuracy of the analytical results will be compromised. Do not attach any additional sample label to the pre-weighed sample vials. Sample identification should be written on the labels that were pre-attached to these containers by the laboratory.

9. At each sampling location, repeat the procedure two additional times to collect samples in the second and third vials with preservative.

10. The soil sample should be completely covered by the liquid preservative in the vial. Gently swirl the sealed vial to insure the soil is all covered by preservative liquid. If there remains dry soil not in contact with liquid, another, smaller sample aliquot should be collected using a new pre-weighed vial.

11. After sample collection, weigh the vials again. The difference in weight between before and after sample insertion should be 5.0 ± 0.5 g. If not, collect new samples, adjusting the aliquot sizes so that they are close to 5g.

12. Record sample identification information on the label that was previously attached to the vial using an indelible marker. The three vials should be placed in a separate sealed plastic bag.

13. Trip blanks accompanying solid samples will consist of three vials with the same preservatives in the same amounts as for the solid samples. They will remain unopened during the field effort, but will otherwise accompany and be treated the same as the vials used to collect and preserve solid samples.

14. All samples will be immediately placed in a cooler with ice, to lower the temperature to 4°C ±2°. No water should be allowed to be in direct contact with the sample containers, to avoid water entering the containers.

15. All samples preserved in the field should be maintained refrigerated and shipped or transported to the laboratory, where the samples preserved in deionized water **must be frozen within 48 hours**.

16. After freezing, all samples should be analyzed within 10 days of verified sample receipt. Data will be considered valid as long as the samples preserved in deionized water are frozen within 48 hours from time of sample collection and all necessary analyzes are performed within the technical holding time of 14 days from time of sample collection.

EPA-NE QAPP Worksheet #9d - Rev. 10/99
Complete this worksheet for each medium/matrix, analytical parameter, and concentration level. Identify all laboratories/organizations that will provide analytical services for the project, including field screening, field analytical, and fixed laboratory analytical work. If applicable, identify the backup laboratory/organization that will be used if the primary laboratory/organization
cannot be used. (Refer to *QAPP Manual* Sections 6.1, 11.0 and 12.0 for guidance.)

Analytical Services Table (Fixed Lab Analyses)

Medium/ Matrix	Analytical Parameter	Concentration Level	Analytical Method/SOP[1]	Data Package Turnaround Time	Laboratory/Organization (Name and Address: Contact Person and Telephone Number)	Backup Laboratory/Organization (Name and Address: Contact Person and Telephone Number)
SE	*TCO*	*Low-Med*	*ASTM D-2974*	*21 days*	*Rhode Island Analytical* *41 Illinois Avenue* *Warwick, RI 02904-2283* *Jim Mich* *(401) 737-8500*	—
SO/SSO	*VOCs*	*Low-Med*	*OLM04.3*	*21 days*	*Mitkem Corporation* *175 Metro Center Boulevard* *Warwick, RI 02886-1755* *Ed Lawler* *(401) 732-3400* *fax: (401) 732-3499*	---
SO/SSO	*SVOCs* *(inc. PAH)* *PCBs* *Pesticides* *Cyanide* *Metals*	*Low-Med*	*OLM04.3* *ILM04.1*	*21 days*		
SSO	*TOC*	*Low*	*Lloyd-Kahn*	*21 days*		
SSO	*TCO*	*Low*	*ASTM D-2974*	*21 days*	*Rhode Island Analytical* *41 Illinois Avenue* *Warwick, RI 02904-2283* *Jim Mich* *(401) 222-5600* *fax: (401) 222-698521 days*	---

Complete this worksheet for each medium/matrix, analytical parameter, and concentration level. Identify all laboratories/organizations that will provide analytical services for the project, including field screening, field analytical, and fixed laboratory analytical work. If applicable, identify the backup laboratory/organization that will be used if the primary laboratory/organization
cannot be used. (Refer to *QAPP Manual* Sections 6.1, 11.0 and 12.0 for guidance.)

Analytical Services Table (Fixed Lab Analyses)

Medium/ Matrix	Analytical Parameter	Concentration Level	Analytical Method/SOP[1]	Data Package Turnaround Time	Laboratory/Organization (Name and Address: Contact Person and Telephone Number)	Backup Laboratory/Organization (Name and Address: Contact Person and Telephone Number)
SW	*Arsenic*	*Low*	*1632 modified*	*28 days*	*Brooks Rand LLC* *3958 6th Ave NW* *Seattle, WA 98107* *Colin Davies* *(206) 632-6206* *fax: (206) 632-6017*	—
SW	*BOD*	*Low*	*405.1*	*21 days*	*Rhode Island Analytical* *41 Illinois Avenue* *Warwick, RI 02904-2283* *Jim Mich* *(401) 737-8500*	—
SW	*Fecal Coliform*	*Low*	*9221E*	*21 days*		
SE	*VOCs*	*Low-Med*	*OLM04.3*	*21 days*	*Mitkem Corporation* *175 Metro Center Boulevard* *Warwick, RI 02886-1755* *Ed Lawler* *(401) 732-3400* *fax: (401) 732-3499*	—
SE	*PAH*	*Low-Med*	*8270SIM*	*21 days*		
SE	*SVOCs* *PCBs* *Pesticides* *Cyanide* *Metals*	*Low-Med*	*OLM04.3* *OLM04.3 modified* *ILM04.1*	*21 days*		
SE	*TOC*	*Low*	*Lloyd-Kahn*	*21 days*		

EPA-NE QAPP Worksheet #9d - Rev. 10/99
Complete this worksheet for each medium/matrix, analytical parameter, and concentration level. Identify all laboratories/organizations that will provide analytical services for the project, including field screening, field analytical, and fixed laboratory analytical work. If applicable, identify the backup laboratory/organization that will be used if the primary laboratory/organization
cannot be used. (Refer to *QAPP Manual* Sections 6.1, 11.0 and 12.0 for guidance.)

Analytical Services Table (Fixed Lab Analyses)

Medium/ Matrix	Analytical Parameter	Concentration Level	Analytical Method/SOP[1]	Data Package Turnaround Time	Laboratory/Organization (Name and Address: Contact Person and Telephone Number)	Backup Laboratory/Organization (Name and Address: Contact Person and Telephone Number)
SW	*VOCs*	*Low*	*OLC03.2*	*21 days*	*Mitkem Corporation* *175 Metro Center Boulevard* *Warwick, RI 02006-1755* *Ed Lawler* *(401) 732-3400* *fax: (401) 732-3499*	—
SW	*SVOCs*	*Low*	*OLC03.2*	*21 days*		
SW	*PAH*	*Low*	*8270SIM*	*21 days*		
SW	*PCBs* *Pesticides*	*Low*	*OLC03.2*	*21 days*		
SW	*Cyanide*	*Low*	*ILM04.2*	*21 days*		
SW	*Metals exc. As*	*Low*	*ILM04.2*	*21 days*		
SW	*Chloride*	*Low*	*SM4500-Cl B*	*21 days*		
SW	*Hardness*	*Low*	*SM2340 D*	*21 days*		
SW	*TOC*	*Low*	*415.1*	*21 days*		
SW	*Sulfate*	*Low*	*SM4500*	*21 days*		
SW	*Ammonia*	*Low*	*SM4500*	*21 days*		
SW	*Nitrite,* *Nitrate*	*Low*	*SM4500* *353.2*	*21 days*		
SW	*Ortho-* *Phosphate*	*Low*	*SM4500*	*21 days*		

EPA-NE QAPP Worksheet #9d - Rev. 10/99
Complete this worksheet for each medium/matrix, analytical parameter, and concentration level. Identify all laboratories/organizations that will provide analytical services for the project, including field screening, field analytical, and fixed laboratory analytical work. If applicable, identify the backup laboratory/organization that will be used if the primary laboratory/organization cannot be used. (Refer to *QAPP Manual* Sections 6.1, 11.0 and 12.0 for guidance.)

Analytical Services Table (Fixed Lab Analyses)

Medium/ Matrix	Analytical Parameter	Concentration Level	Analytical Method/SOP[1]	Data Package Turnaround Time	Laboratory/Organization (Name and Address: Contact Person and Telephone Number)	Backup Laboratory/Organization (Name and Address: Contact Person and Telephone Number)
AR	*VOCs*	*Med-High*	*TO-15*	*21 days*	*STL Los Angeles 1721 South Grand Avenue Santa Ana, CA 92705 Sonia Tabirara (714) 258-8610 x325 fax: (714) 258-0921*	*STL Knoxville 5815 Middlebrook Pike Knoxville, TN 37921 Jamie McKinney (865) 291-3000 fax: (865) 584-4315*
AR	*LF Gases (1)*	*Med-High*	*ASTM D-1946*	*21 days*		
AR	*Hydrogen Sulfide*	*Med-High*	*EPA 16*	*21 days*		
GW	*VOCs*	*Low*	*OLC03.2*	*21 days*	*Mitkem Corporation 175 Metro Center Boulevard Warwick, RI 02886-1755 Ed Lawler (401) 732-3400 fax: (401) 732-3499*	---
GW	*SVOCs*	*Low*	*OLC03.2*	*21 days*		
GW	*PAH*	*Low*	*8270SIM*	*21 days*		
GW	*PCBs Pesticides*	*Low*	*OLC03.2*	*21 days*		
GW	*Cyanide*	*Low*	*ILM04.1*	*21 days*		
GW	*Metals exc. As*	*Low*	*ILM04.1*	*21 days*		
GW	*Chloride*	*Low*	*SM4500-Cl B*	*21 days*		
GW	*Arsenic*	*Low*	*1632 modified*	*28 days*	*Brooks Rand LLC 3958 6th Ave NW Seattle, WA 98107 Colin Davies (206) 632-6206 fax: (206) 632-6017*	---

Analytical Services Table (Fixed Lab Analyses)

Medium/ Matrix	Analytical Parameter	Concentration Level	Analytical Method/SOP[1]	Data Package Turnaround Time	Laboratory/Organization (Name and Address: Contact Person and Telephone Number)	Backup Laboratory/Organization (Name and Address: Contact Person and Telephone Number)
SSO (geotech)	*Grain Size Soil Class Nat. Moisture*	*NA*	*ASTM D-422 ASTMD-2487 ASTM D-2216*	*21 days*	*Shield Engineering, Inc. 4301 Taggart Creek Road Charlotte, NC 28208 Thomas M. Vick, P. E. (704) 394-6913*	---
SSO (geotech)	*Spc. Gravity Dry Unit Wt Blk Density Porosity*	*NA*	*ASTM D-854 ASTM D-698 Calculate*	*21 days*		

[1]**Specify appropriate reference number/letter from the Field Analytical Method/SOP Reference Table (EPA-NE QAPP Worksheet #17) and from the Fixed Laboratory Method/SOP Reference Table (EPA-NE QAPP Worksheet #20).**
(1) LF Gases = Landfill and other Fixed Gases = Methane, Carbon Dioxide, Carbon Monoxide, Ethane, Ethene, Nitrogen, and Oxygen

Complete this worksheet for each medium/matrix, analytical parameter, and concentration level. Identify all laboratories/organizations that will provide analytical services for the project, including field screening, field analytical, and fixed laboratory analytical work. If applicable, identify the backup laboratory/organization that will be used if the primary laboratory/organization cannot be used. (Refer to *QAPP Manual* Sections 6.1, 11.0 and 12.0 for guidance.)

Analytical Services Table (Field Analyses)

Medium/ Matrix	Analytical Parameter	Concentration Level	Analytical Method/SOP[1]	Data Package Turnaround Time	Laboratory/Organization (Name and Address: Contact Person and Telephone Number)	Backup Laboratory/Organization (Name and Address: Contact Person and Telephone Number)
AR Soil Gas	*TVOCs*	*Low*	*SEA-09-01*	*NA*	*ZEBRA Environmental, Inc.* *30 No. Prospect Avenue* *Lynnbrook, NY 11563* *Matt Ednie* *(518) 456-9922* *fax: (518) 456-4009*	
AR Ambient Air	*TVOCs/PID* *TVOCs/FID* O_2/*LEL*/H_2S *VOCs by Draeger CMS* *Air Particul.* *Radiation*	*Low*	*SEA-08-02*	*NA*	*Shield Environmental Assoc., Inc.* *2456 Fortune Drive* *Lexington, KY 40509* *Jim Knauss* *(859) 294-5155* *fax: (859) 294-5255*	
GW, SW	*Ec* *pH* *Temperature* *DO* *ORP* *Turbidity*	*Low*	*SEA-07-01*	*NA*	*Shield Environmental Assoc., Inc.* *2456 Fortune Drive* *Lexington, KY 40509* *Jim Knauss* *(859) 294-5155* *fax: (859) 294-5255*	
SO	*Soil Strength Properties*	*NA*	*ASTM D-3441*	*NA*	*Shield Engineering, Inc.* *4301 Taggart Creek Road* *Charlotte, NC 28208* *Thomas M. Vick, P. E.* *(704) 394-6913*	
WT	*Waste Strength Properties*	*NA*	*ASTM D-4719*	*NA*		

[1]Specify appropriate reference number/letter from the Field Analytical Method/SOP Reference Table (EPA-NE QAPP Worksheet #17) and from the Fixed Laboratory Method/SOP Reference Table (EPA-NE QAPP Worksheet #20).

Alison Dunn

From: Schkuta, Andrew [Andrew.Schkuta@m-e.com]
Sent: Friday, September 05, 2003 4:37 PM
To: Edward A. Lawler; Beliveau.Andy@epamail.epa.gov
Cc: Alison Dunn; Lapite, Constance
Subject: RE: Peterson-Puritan OU-2, Chloride analysis method change

Ed/Andy

For your information, M&E is analyzing the split samples for chloride analysis using EPA method 300.0.

Andy Schkuta

-----Original Message-----
From: Edward A. Lawler [mailto:elawler@mitkem.com]
Sent: Friday, September 05, 2003 4:21 PM
To: Schkuta, Andrew; Beliveau.Andy@epamail.epa.gov
Cc: Alison L. Dunn
Subject: Peterson-Puritan OU-2, Chloride analysis method change

Andy & Andy--

This note is to confirm our conversation a couple of days ago regarding Mitkem's changing the chloride analysis method for samples collected by Shield Environmental at the Peterson Puritan OU-2 site.

The QAP references Standard Methods 4500-Cl-B method (manual argentometric analysis).

Mitkem now routinely performs the automated ferricyanide method, EPA 325.2.

The automated method will provide equal or lower reporting limits compared to the manual method, with a likely improvement in other data quality areas due to the automation of the procedure.

As we discussed, neither of you expressed any reservation with Mitkem changing to the automated EPA 325.2 procedure.

If you have any questions or comments, please call me.

--Ed Lawler

Edward A. Lawler
Laboratory Operations Manager
Mitkem Corporation
Phone--401-732-3400 Fax--401-732-3499

MITKEM CORPORATION

MEMORANDUM

October 31, 2003

To: Alison Dunn, Shield Environmental Associates

From: Ed Lawler, Laboratory Operations Manager, Mitkem Corporation

Cc: Andy Beliveau, EPA Region I

Re: Peterson Puritan OU-2, Sediment Samples
Low Level PAH-SIM Analysis Decision Tree

As you know, the QAPP for this project requires an analytical approach to quantify low levels of Polynuclear Aromatic Hydrocarbon (PAH) compounds in sediment samples using Selected Ion Monitoring GC/MS (PAH-SIM). The QAPP currently includes a Special Operating Procedure (SpOP) for rapid screening of solid samples. This screening procedure was developed to isolate the low level samples requiring the PAH-SIM analysis from samples with high levels of PAH compounds that do not need PAH-SIM anlaysis, in order to prevent potential cross-contamination during sample handling and prep.

All of the sediment samples were frozen upon receipt, to suspend the holding time as proposed in the SpOP. An aliquot of each sample reserved for potential PAH-SIM analysis is still frozen. As you and I discussed in early September, Mitkem decided to use the OLM04.2 CLP semivolatile organic (SVOA) analysis instead of the quick GC screening analysis to determine which samples were high or low. This is because the CLP analysis would provide a much more reliable basis for the PAH-SIM decision than the quick GC screen approach. We are just now completing the CLP SVOA analyses, and would like to perform the PAH-SIM analyses next week. It is important, therefore, to finalize the "decision tree" according to which samples will be selected for the PAH-SIM analysis immediately.

The text of the QAPP and the SpOP note that samples containing high levels of PAH compounds do not require low level PAH-SIM analyses. However, these documents do not contain numerical criteria to define what constitutes a high or low level of PAH compounds. A few days ago, I had a discussion with Andy Beliveau of EPA Region 1 in an attempt to clarify the process. The purpose of this memo, which incorporates elements from that discussion as well as input from Andy Schkuta of Metcalf & Eddy, is to formalize the numerical criteria and the selection process based on what is practically achievable using the PAH-SIM method, as a supplement to the QAPP already in place for the project.

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The following paragraphs summarize the "decision tree" process we propose to follow in selecting samples for the SIM-PAH analysis:

- Samples containing no detected PAH compounds, or only "J-flagged" values from the CLP SVOC analysis, are "low level" samples appropriate for PAH-SIM analysis, and will be selected for analysis using that procedure.

- PAH values reported from the CLP SVOC analysis that exceed the upper calibration limit (are "E-flagged") are considered extremely high. Samples containing CLP "E-flagged" values for any of the PAH compounds would be expected to provide significant analytical difficulty using the SIM approach. Samples with these levels are "high level" samples not appropriate for SIM analysis. Therefore, these will not be analyzed using the low level PAH-SIM method. Results from the full scan analyses, including all necessary dilutions, will be reported.

- Values reported from the CLP SVOC analysis that are within the calibration range (are unqualified) are reliable concentrations. These values will exceed the upper calibration limit for the PAH-SIM analysis (i.e., would be "E-flagged" for that procedure). The more "E-flagged" PAH-SIM compounds contained in a sample, the more likely it will provide analytical difficulty and potentially cross-contaminate the cleaner samples. I propose the following five criteria for deciding which of these "intermediate level" samples are appropriate for SIM analysis:

    1. If the total PAH concentration exceeds 10,000 ppb and benzo(a)pyrene is detected (either unqualified or estimated) at greater than 5x the concentration in the associated method blank, SIM analysis will not be performed.
    2. If the concentrations of two or more PAH compounds exceed 1,000 ppb, and benzo(a)pyrene is detected (either unqualified or estimated) at greater than 5x the concentration in the associated method blank, SIM analysis will not be performed.
    3. If conditions 1 and 2 do not apply, but at least 6 out of the 18 PAH compounds have concentrations exceeding both the Practical Quantitation Limit (unqualified concentrations) and the Project Action Limits (PALs), and benzo(a)pyrene is one of the compounds with an unqualified concentration above the PAL, SIM analysis will not be performed.
    4. If conditions 1 and 2 do not apply, and the concentration of benzo(a)pyrene is J-qualified from the CLP SVOC analysis, the SIM analysis will be performed.
    5. If conditions 1 and 2 do not apply, and fewer than 6 out of the 18 PAH compounds have unqualified concentrations exceeding the PALs, the SIM analysis will be performed.

I believe these criteria address the QAPP goals of providing the low level analyses where necessary, while simultaneously preventing inappropriate mixing of low and high samples from invalidating the results.

Appendix C

C Photographs

All of the photographs taken by Shield during the Phase 1A field activities are reproduced on a CD-ROM provided at the end of this report, where they are organized by date. They are provided in three formats: as high-resolution JPG files, as low-resolution JPG files (thumbnails), and as PDF files by date. The file names are listed below, chronologically, along with a short caption for each. All of the photograph file names, except for the photographs taken the week of October 6, 2003, incorporate the date of the photo after the PP prefix, as follows: YYYYMMDD. The photographs taken the week of October 6 were not sorted by individual day, and they are named according to their original file name, in the list below and on the CD-ROM.

Photograph	Description
PP20030805 - 01.JPG	Overgrowth in the vicinity of MW-111 wells
PP20030805 - 02.JPG	Pond C during low flow conditions
PP20030805 - 03.JPG	Pond B (dry) during low flow conditions
PP20030805 - 04.JPG	Overgrowth/vegetation on landfill
PP20030805 - 05.JPG	Overgrowth/vegetation on wetlands side of P&W railroad tracks
PP20030805 - 06.JPG	Overgrowth/vegetation in wetlands
PP20030805 - 07.JPG	Overgrowth/vegetation on landfill
PP20030805 - 08.JPG	Pond B (dry)
PP20030805 - 09.JPG	Pond B (dry)
PP20030805 - 10.JPG	Partially buried tank in Pond B (dry)
PP20030805 - 11.JPG	Overgrowth/vegetation in the vicinity of monitoring well P-7
PP20030806 - 01.JPG	Removal of barricade between Nunes Property and landfill access road
PP20030806 - 02.JPG	Cleared access road
PP20030806 - 03.JPG	Access/haul road construction near Debris Field 4
PP20030806 - 04.JPG	Access/haul road construction near Debris Field 4
PP20030806 - 05.JPG	Access/haul road construction near Debris Field 4

Photograph	Description
PP20030806 - 06.JPG	Access/haul road construction near Debris Field 4
PP20030807 - 01.JPG	Piezometer 1 (PZ-01)
PP20030807 - 02.JPG	Piezometer 1 (PZ-01)
PP20030807 - 03.JPG	Silt fence near Debris Field 4
PP20030807 - 04.JPG	Silt fence near Debris Field 4
PP20030807 - 05.JPG	Piezometer 2 (PZ-02) at inlet to Pond C
PP20030807 - 06.JPG	Piezometer 2 (PZ-02) at inlet to Pond C
PP20030807 - 07.JPG	Installation of Piezometer 3 (PZ-03) in Pond B
PP20030807 - 08.JPG	Installation of Piezometer 3 (PZ-03) in Pond B
PP20030807 - 09.JPG	Installation of Piezometer 4 (PZ-04) downstream of Pratt Dam
PP20030807 - 10.JPG	Piezometer 5 (PZ-05) in Pond F
PP20030807 - 11.JPG	Installation of Piezometer 6 (PZ-06) in main channel upstream of Pratt Dam adjacent to the unnamed island
PP20030807 - 12.JPG	Installation of Piezometer 6 (PZ-06) in main channel upstream of Pratt Dam adjacent to the unnamed island
PP20030807 - 13.JPG	Installation of Piezometer 7 (PZ-07) in dead channel of river adjacent to the unnamed island
PP20030807 - 14.JPG	Installation of Piezometer 7 (PZ-07) in dead channel of river adjacent to the unnamed island
PP20030807 - 15.JPG	Installation of Piezometer 9 (PZ-09) in Pond A on unnamed island
PP20030807 - 16.JPG	Piezometer 9 (PZ-09) in Pond A
PP20030807 - 17.JPG	Piezometer 10 (PZ-10) in wetlands
PP20030807 - 18.JPG	Piezometer 10 (PZ-10) in wetlands
PP20030807 - 19.JPG	Piezometer 10 (PZ-10) in wetlands
PP20030807 - 20.JPG	Piezometer 11 (PZ-11) in wetlands
PP20030808 - 01.JPG	Piezometer 1 (PZ-01) in Blackstone River after heavy rain event
PP20030808 - 02.JPG	Inlet to Pond C after heavy rain event

Photograph	Description
PP20030808 - 03.JPG	Pond C after heavy rain event
PP20030808 - 04.JPG	Pond B after heavy rain event
PP20030808 - 05.JPG	Haul road
PP20030808 - 06.JPG	MW-111 series following clearing
PP20030808 - 07.JPG	MW-111 series following clearing
PP20030808 - 08.JPG	MW-109 series following clearing
PP20030808 - 09.JPG	Haul road conditions following heavy rain event
PP20030808 - 10.JPG	Flooded area near monitoring well P-8 (seen in background)
PP20030808 - 11.JPG	Flooded area near monitoring well P-8
PP20030808 - 12.JPG	Haul road after heavy rain
PP20030808 - 13.JPG	Haul road after heavy rain
PP20030808 - 14.JPG	Haul road after heavy rain
PP20030808 - 15.JPG	Haul road after heavy rain
PP20030808 - 16.JPG	Haul road after heavy rain
PP20030808 - 17.JPG	Pond B after heavy rain event
PP20030808 - 18.JPG	Haul road after heavy rain
PP20030808 - 19.JPG	Haul road after heavy rain
PP20030808 - 20.JPG	Haul road after heavy rain
PP20030808 - 21.JPG	Haul road after heavy rain
PP20030808 - 22.JPG	Wells C-1 and C-2 after heavy rain event
PP20030808 - 23.JPG	Drum storage area, first aid station, and hand wash
PP20030808 - 24.JPG	Lower path at toe of landfill
PP20030808 - 25.JPG	Lower path at toe of landfill

Photograph	Description
PP20030808 - 26.JPG	Retaining wall near toe of landfill
PP20030811 - 01.JPG	Graded fill from Pratt Dam to unnamed island
PP20030811 - 02.JPG	Installation of piezometer (PZ-5) in Pond F behind Pratt Dam
PP20030811 - 04.JPG	Wetlands (PZ-15)
PP20030811 - 05.JPG	Haul road
PP20030811 - 06.JPG	Haul road
PP20030811 - 07.JPG	Rock and geotextile on haul road
PP20030811 - 08.JPG	Haul road
PP20030811 - 09.JPG	Haul road
PP20030811 - 10.JPG	Buried waste coming to surface under section of haul road near Pond B
PP20030812 - 01.JPG	Haul road
PP20030812 - 02.JPG	Lower geophysical path at landfill (Line 2) with geophysical survey flags
PP20030812 - 03.JPG	Haul road with rock and geotextile fabric
PP20030812 - 04.JPG	Lower geophysical path at landfill (Line 2) near P-8
PP20030812 - 05.JPG	Haul road near the proposed locations for SEA-602A and SEA-602B
PP20030812 - 06.JPG	Haul road with rock and geotextile fabric
PP20030812 - 07.JPG	Piezometer (PZ-16) on unnamed island
PP20030812 - 08.JPG	Piezometer (PZ-1) taken from the unnamed island
PP20030812 - 09.JPG	Piezometer on unnamed island
PP20030812 - 10.JPG	Blackstone River downstream of Pratt Dam
PP20030812 - 11.JPG	Blackstone River upstream of Pratt Dam
PP20030813 - 01.JPG	Geophysical survey (Weston Geophysical – Peter Hubbard) on main haul road
PP20030813 - 02.JPG	Haul road near Pond B

Photograph	Description
PP20030813 - 03.JPG	Decontamination pad construction
PP20030813 - 04.JPG	Decontamination pad construction
PP20030813 - 05.JPG	Decontamination pad construction
PP20030814 - 01.JPG	Decontamination pad construction
PP20030814 - 02.JPG	Decontamination pad construction
PP20030814 - 03.JPG	Decontamination pad construction
PP20030814 - 04.JPG	Unnamed Island – Trench #1 (Debris pile between Ponds A and E)
PP20030814 - 05.JPG	Unnamed Island - Surface debris in the vicinity of Trench #3 (South of Pond A)
PP20030814 - 06.JPG	Unnamed Island - Surface debris in the vicinity of Trench #3 (South of Pond A)
PP20030814 - 07.JPG	Unnamed Island - Surface debris in the vicinity of Trench #3 (South of Pond A)
PP20030814 - 08.JPG	Unnamed Island - Surface debris in the vicinity of Trench #3 (South of Pond A)
PP20030814 - 09.JPG	Unnamed Island – Excavation of Trench #1 (Soil and demolition debris)
PP20030814 - 10.JPG	Unnamed Island – Excavation of Trench #1 (Soil and demolition debris)
PP20030814 - 11.JPG	Unnamed Island – Excavation of Trench #1 (Soil and demolition debris)
PP20030814 - 12.JPG	Unnamed Island – Excavation of Trench #1 (Soil and demolition debris)
PP20030814 - 13.JPG	Unnamed Island – Excavation of Trench #1 (Soil and demolition debris)
PP20030814 - 14.JPG	Unnamed Island – Excavation of Trench #1 (Insulated piping)
PP20030814 - 15.JPG	Unnamed Island – Temporary exclusion zone in the vicinity of Trenches #1 and #2
PP20030814 - 16.JPG	Unnamed Island – Temporary exclusion zone in the vicinity of Trenches #1 and #2
PP20030814 - 17.JPG	Unnamed Island – Excavation of Trench #1 (Probable Fiber Glass insulation?)
PP20030814 - 18.JPG	Unnamed Island – Excavation of Trench #1 (Steel piping, fencing material and bricks)
PP20030814 - 19.JPG	Unnamed Island – Excavation of Trench #1 (Steel floor grating)
PP20030814 - 20.JPG	Unnamed Island – Excavation of Trench #1 (Steel piping and bricks)

Photograph	Description
PP20030814 - 21.JPG	Unnamed Island – Excavation of Trench #1 (Steel piping and bricks)
PP20030814 - 22.JPG	Unnamed Island – Excavation of Trench #1 (Steel piping and bricks)
PP20030814 - 23.JPG	Unnamed Island – Excavation of Trench #1 (Steel piping and bricks)
PP20030814 - 24.JPG	Unnamed Island – Excavation of Trench #2 (Steel piping and bricks)
PP20030814 - 25.JPG	Unnamed Island – Excavation of Trench #2 (Steel piping and bricks)
PP20030814 - 26.JPG	Unnamed Island – Excavation of Trench #2 (Steel piping and bricks)
PP20030814 - 27.JPG	Unnamed Island – Excavation of Trench #2 (Steel piping and bricks)
PP20030814 - 28.JPG	Unnamed Island – Excavation of Trench #2 (Steel piping and bricks)
PP20030814 - 29.JPG	Unnamed Island – Excavation of Trench #2 (Steel piping and bricks)
PP20030814 - 30.JPG	Unnamed Island – Excavation of Trench #2 (Steel piping and bricks)
PP20030814 - 31.JPG	Unnamed Island – Excavation of Trench #2 (Steel piping and bricks)
PP20030814 - 32.JPG	Unnamed Island – Excavation of Trench #2 (Steel piping and bricks)
PP20030814 - 33.JPG	Unnamed Island – Trench #3 (Unknown waste)
PP20030814 - 34.JPG	Unnamed Island – Trench #3 (Piping/Metal Debris)
PP20030814 - 35.JPG	Unnamed Island – Trench #3 (Piping/Metal Debris)
PP20030814 - 36.JPG	Unnamed Island – Trench #3 (Appliances, drums, and metal debris)
PP20030814 - 37.JPG	Unnamed Island – Trench #3 (Appliances, drums, and metal debris)
PP20030814 - 38.JPG	Unnamed Island – Trench #3 (Appliances, drums, and metal debris)
PP20030814 - 39.JPG	Unnamed Island – Trench #3 (Unknown waste)
PP20030814 - 40.JPG	Unnamed Island – Trench #3 (Unknown waste)
PP20030814 - 41.JPG	Unnamed Island – Trench #3 (Appliances, drums, and metal debris)
PP20030814 - 42.JPG	Unnamed Island – Trench #3 (Appliances, drums, metal debris, and brick)
PP20030814 - 43.JPG	Unnamed Island – Trench #3 (Appliances, drums, metal debris, and brick)

Photograph	Description
PP20030815 - 01.JPG	Unnamed Island – Buried debris in Test Pit #6
PP20030815 - 02.JPG	Unnamed Island – Buried debris in Test Pit #6
PP20030815 - 03.JPG	Unnamed Island – Buried debris in Test Pit #6
PP20030815 - 04.JPG	Unnamed Island – Groundwater in Test Pit #6 (location of GW-LE01-UI)
PP20030815 - 05.JPG	Unnamed Island - Pond E (Tire Dump)
PP20030815 - 06.JPG	Unnamed Island – Tire Dump (adjacent to Pond E)
PP20030815 - 07.JPG	Unnamed Island – Tire Dump (adjacent to Pond E)
PP20030815 - 08.JPG	Unnamed Island – Tire Dump (adjacent to Pond E)
PP20030815 - 09.JPG	Unnamed Island – Small test pit in tire dump near Pond E and Test Trench #4
PP20030815 - 10.JPG	Unnamed Island – Trench #4 (Tire Dump)
PP20030815 - 11.JPG	Unnamed Island – Test Trench #2 with caution tape and silt fence
PP20030815 - 12.JPG	Unnamed Island – Test Trench #1 with caution tape and silt fence
PP20030815 - 13.JPG	Unnamed Island – Test Pit #5 near abandoned excavator
PP20030815 - 14.JPG	Unnamed Island – Test Pit #5 near abandoned excavator
PP20030815 - 15.JPG	Unnamed Island – Metal ring found in Test Pit #5
PP20030815 - 16.JPG	Unnamed Island – Test Pit #5 near abandoned excavator
PP20030815 - 17.JPG	Unnamed Island – Union Carbide bag found in Test Pit #5
PP20030815 - 18.JPG	Unnamed Island – Test Pit #5 near abandoned excavator
PP20030815 - 19.JPG	Unnamed Island – Union Carbide bag found in Test Pit #5
PP20030815 - 20.JPG	Unnamed Island - Debris from Test Pit #5
PP20030815 - 21.JPG	Unnamed Island – Surface debris in the vicinity of Test Pit #6
PP20030815 - 22.JPG	Unnamed Island - Debris from Test Pit #5
PP20030815 - 23.JPG	Unnamed Island – Standing water in vicinity of Test Pit #6

Photograph	Description
PP20030815 - 24.JPG	Unnamed Island – Test Pit #6
PP20030815 - 25.JPG	Unnamed Island – Buried debris in Test Pit #6
PP20030815 - 26.JPG	Unnamed Island – Buried debris in Test Pit #6
PP20030815 - 27.JPG	Unnamed Island – Buried debris in Test Pit #6
PP20030815 - 28.JPG	Unnamed Island – Buried debris in Test Pit #6
PP20030815 - 29.JPG	Unnamed Island – Groundwater in Test Pit #6 (location of GW-LE01-UI)
PP20030818 - 01.JPG	Unnamed Island – Trench 10 (Hose and plastic debris)
PP20030818 - 02.JPG	Unnamed Island – Trench 11 (Hose and plastic debris)
PP20030818 - 03.JPG	Unnamed Island – Trench 12 (Hose and plastic debris)
PP20030818 - 04.JPG	Unnamed Island – Trench 9
PP20030818 - 05.JPG	Unnamed Island – Trench 9 (Tire)
PP20030818 - 06.JPG	Unnamed Island – Trench 9
PP20030818 - 07.JPG	Unnamed Island – Trench 9 (Candelabra Tubes)
PP20030818 - 08.JPG	Unnamed Island – Trench 9
PP20030818 - 09.JPG	Unnamed Island – Trench 9
PP20030818 - 10.JPG	Unnamed Island – Trench 9
PP20030818 - 11.JPG	Unnamed Island – Trench 10
PP20030818 – 12.JPG	Unnamed Island – Trench 10 – Waste in trackhoe bucket
PP20030818 – 13.JPG	Unnamed Island – Trench 10 – Woven nylon strips
PP20030818 – 14.JPG	Unnamed Island – Trench 10 – Buried waste
PP20030818 – 15.JPG	Unnamed Island – Trench 10 – Buried waste
PP20030818 – 16.JPG	Unnamed Island – Trench 10 – Buried waste (shoe)
PP20030818 - 17.JPG	Unnamed Island – Trench 10 – Leachate/waste

Photograph	Description
PP20030818 – 18.JPG	Unnamed Island – Trench 10 – Buried waste (hose)
PP20030818 – 19.JPG	Unnamed Island – Trench 10 – Buried waste
PP20030818 – 20.JPG	Unnamed Island – Trench 10 – Buried waste (hose/plastic)
PP20030818 – 21.JPG	Unnamed Island – Trench 10 – Buried waste (hose)
PP20030818 – 22.JPG	Unnamed Island – Trench 10 – Buried waste
PP20030818 – 23.JPG	Unnamed Island – Trench 10 – Buried waste
PP20030818 – 24.JPG	Unnamed Island – Trench 10 – Buried waste (wood)
PP20030818 – 25.JPG	Unnamed Island – Trench 10 – Buried waste (nylon strips)
PP20030818 – 26.JPG	Unnamed Island – Trench 10 – Buried waste (nylon strips)
PP20030818 – 27.JPG	Unnamed Island – Trench 10 – Buried waste (nylon strips and hose)
PP20030818 – 28.JPG	Unnamed Island – Trench 10 – Buried waste (plastic and hose)
PP20030818 – 29.JPG	Unnamed Island – Trench 10 – Bucket with soil
PP20030818 – 30.JPG	Unnamed Island – Trench 10 – Buried waste (plastic cylinder)
PP20030818 – 31.JPG	Unnamed Island – Trench 10 – Buried waste
PP20030818 – 32.JPG	Unnamed Island – Trench 10 – Buried waste (wood, hose and brick)
PP20030818 – 33.JPG	Unnamed Island – Trench 11 – Near surface plastic debris
PP20030818 – 34.JPG	Unnamed Island – Trench 11 – Buried waste (plastic strips)
PP20030818 – 35.JPG	Unnamed Island – Trench 11 – Buried waste (metal cylinder)
PP20030818 – 36.JPG	Unnamed Island – Trench 11 – Buried waste (plastic strips and hose)
PP20030818 – 37.JPG	Unnamed Island – Trench 11 – Buried waste (plastic strips and hose)
PP20030818 – 38.JPG	Unnamed Island – Trench 11 – End of waste
PP20030818 – 39.JPG	Unnamed Island – Trench 11 – End of waste
PP20030818 – 40.JPG	Unnamed Island – Trench 12 – Surface vegetation

Photograph	Description
PP20030818 – 41.JPG	Unnamed Island – Trench 12
PP20030818 – 42.JPG	Unnamed Island – Trench 12
PP20030818 – 43.JPG	Unnamed Island – Trench 12 – Buried Debris (tires/metal)
PP20030818 – 44.JPG	Unnamed Island – Trench 13 – No buried waste
PP20030818 – 45.JPG	Unnamed Island – Trench 14 – No buried waste
PP20030818 – 46.JPG	Unnamed Island – Trench 15 – No buried waste
PP20030818 – 47.JPG	Unnamed Island – Trench 15 – Surface after excavation
PP20030818 – 48.JPG	Unnamed Island – Trench 16 – No buried waste
PP20030818 – 49.JPG	Unnamed Island – Trench 16 – No buried waste
PP20030818 – 50.JPG	Unnamed Island – Trench 16 – No buried waste
PP20030818 – 51.JPG	Unnamed Island – Trench 16 – No buried waste
PP20030818 – 52.JPG	Unnamed Island – Trench 17 – Surface debris (lumber)
PP20030818 – 53.JPG	Unnamed Island – Trench 17 – Surface debris (lumber)
PP20030818 – 54.JPG	Unnamed Island – Trench 17 – Buried waste (metal)
PP20030818 – 55.JPG	Unnamed Island – Trench 17 – Buried waste (metal)
PP20030818 – 56.JPG	Unnamed Island – Trench 17 – Buried waste (blue plastic and metal)
PP20030818 – 57.JPG	Unnamed Island – Trench 17 – Buried waste (blue plastic and metal)
PP20030818 – 58.JPG	Unnamed Island – Trench 17 – Buried waste (plastic)
PP20030818 – 59.JPG	Unnamed Island – Trench 17 – Buried waste (brick, plastic and metal)
PP20030818 – 60.JPG	Unnamed Island – Trench 17 – Ground water leachate
PP20030818 – 61.JPG	Unnamed Island – Trench 17 – Buried waste (plastic strips)
PP20030818 – 62.JPG	Unnamed Island – Trench 17 – Buried waste (plastic, hose, glass jars)
PP20030818 – 63.JPG	Unnamed Island – Trench 17 – End of buried waste

Photograph	Description
PP20030818 – 64.JPG	Unnamed Island – Trench 17 – End of buried waste
PP20030818 – 65.JPG	Unnamed Island – Trench 18 – Buried waste (plastic)
PP20030818 – 66.JPG	Unnamed Island – Trench 18 – Buried waste (plastic)
PP20030818 – 67.JPG	Unnamed Island – Trench 18 – Small amount of ground water leachate
PP20030818 – 68.JPG	Unnamed Island – Trench 18 – Buried waste (plastic, cans, bottles)
PP20030818 – 69.JPG	Unnamed Island – Trench 18 – Buried waste
PP20030818 – 70.JPG	Unnamed Island – Trench 18 – End of buried waste
PP20030818 – 71.JPG	Unnamed Island – Trench 18 – Buried waste (wood, roofing material)
PP20030819 - 01.JPG	Unnamed Island – Temporary decontamination pad
PP20030820 - 01.JPG	Unnamed Island – Dismantling and removal of the abandoned excavator
PP20030820 - 02.JPG	Wetland/Railroad Tracks – New railroad ties staged between P&W Railroad Tracks and wetlands prior to installation
PP20030820 - 03.JPG	Wetland/Railroad Tracks – New railroad ties staged between P&W Railroad Tracks and wetlands prior to installation
PP20030820 - 04.JPG	Wetland/Railroad Tracks – New railroad ties staged between P&W Railroad Tracks and wetlands prior to installation
PP20030820 - 05.JPG	Nunes Property – Seep inspection at inlet to the Blackstone River west of Nunes Property
PP20030820 - 06.JPG	Nunes Property – Seep inspection at inlet to the Blackstone River west of Nunes Property
PP20030820 - 07.JPG	Nunes Property – Seep inspection at inlet to the Blackstone River west of Nunes Property
PP20030820 - 08.JPG	Nunes Property – Seep inspection at inlet to the Blackstone River west of Nunes Property
PP20030821 - 01.JPG	Landfill – Trench 1
PP20030821 – 02.JPG	Landfill – Trench 1
PP20030821 – 03.JPG	Landfill – Trench 1
PP20030821 – 04.JPG	Landfill – Trench 1
PP20030821 – 05.JPG	Landfill – Trench 2
PP20030821 – 06.JPG	Landfill – Trench 2

Photograph	Description
PP20030821 – 07.JPG	Landfill – Trench 2 – Leachate Sampling
PP20030821 – 08.JPG	Landfill – Trench 2 – Leachate Sampling
PP20030821 – 09.JPG	Landfill – Trench 3
PP20030821 – 10.JPG	Landfill – Trench 3
PP20030821 – 11.JPG	Landfill – Trench 3
PP20030821 -12.JPG	Landfill – Trench 3
PP20030821 – 13.JPG	Landfill – Trench 4
PP20030821 – 14.JPG	Landfill – Trench 4
PP20030821 – 15.JPG	Landfill – Trench 4
PP20030821 – 16.JPG	Landfill – Trench 5
PP20030821 – 17.JPG	Landfill – Trench 5
PP20030821 -18.JPG	Landfill – Trench 5
PP20030821 – 19.JPG	Landfill – Trench 5
PP20030821 – 20.JPG	Landfill – Trench 6
PP20030821 – 21.JPG	Landfill – Trench 6
PP20030821 – 22.JPG	Landfill – Trench 6
PP20030821 -23.JPG	Landfill – Trench 6
PP20030821 – 24.JPG	Membrane Interface Probe (MIP) Investigation
PP20030821 – 25.JPG	Membrane Interface Probe (MIP) Investigation
PP20030821 – 26.JPG	Membrane Interface Probe (MIP) Investigation
PP20030821 - 27.JPG	Pond C
PP20030822 - 01.JPG	Landfill – Test Pit 3 – Silly Putty Eggs
PP20030822 - 02.JPG	Landfill – Test Trench 11 at north gate to landfill

Photograph	Description
PP20030822 - 03.JPG	Landfill – Test Trench 7 adjacent to Debris Field 4 (plastic and hose waste)
PP20030822 - 04.JPG	Landfill – Test Trench 7 adjacent to Debris Field 4 (plastic and hose waste)
PP20030822 - 05.JPG	Landfill – Test Trench 7 adjacent to Debris Field 4 (plastic and hose waste)
PP20030822 - 06.JPG	Landfill – Test Trench 7 – Ground water leachate (GW-LE-005-LF)
PP20030822 - 07.JPG	Landfill – Test Trench 8 – Buried debris
PP20030822 - 08.JPG	Landfill – Test Trench 8 – Buried debris (metal, wood, hose, and plastic)
PP20030822 - 09.JPG	Landfill – Test Trench 8 – Buried debris (metal, wood, hose, and plastic)
PP20030822 - 10.JPG	Landfill – Test Trench 8 – Buried debris (metal, wood, hose, and plastic)
PP20030822 - 11.JPG	Landfill – Test Trench 8 – Buried debris; railroad ties at surface
PP20030822 - 12.JPG	Landfill – Test Trench 8 – Buried debris (metal, wood, hose, and plastic)
PP20030822 - 13.JPG	Landfill – Test Trench 9
PP20030822 - 14.JPG	Landfill – Test Trench 9 – Buried debris (wood, hose, and plastic)
PP20030822 - 15.JPG	Landfill – Test Trench 9 – Buried debris (wood, hose, and plastic)
PP20030822 - 16.JPG	Landfill – Test Trench 9 – Buried debris (wood, hose, and plastic)
PP20030822 - 17.JPG	Landfill – Test Trench 9 – Buried debris (wood, hose, and plastic)
PP20030822 - 18.JPG	Landfill – Test Trench 10
PP20030822 - 19.JPG	Old, recently removed railroad ties stockpiled between tracks and wetlands
PP20030822 - 20.JPG	Old, recently removed railroad ties stockpiled between tracks and wetlands
PP20030822 - 21.JPG	Old, recently removed railroad ties stockpiled between tracks and wetlands
PP20030822 - 22.JPG	Machine used to remove and level tracks
PP20030826 - 01.JPG	Surface soil (waste) sampling points located in Debris Fields 1-3 (SO-W09-DF)
PP20030826 - 02.JPG	Surface soil (waste) sampling points located in Debris Fields 1-3
PP20030826 - 03.JPG	Surface soil (waste) sampling points located in Debris Fields 1-3

Photograph	Description
PP20030826 - 04.JPG	Surface soil (waste) sampling points located in Debris Fields 1-3
PP20030826 - 05.JPG	Surface soil (waste) sampling points located in Debris Fields 1-3
PP20030827 - 01.JPG	Landfill – Surface soil sampling points in Debris Field 4 (SO-W05-LFb)
PP20030827 - 02.JPG	Landfill – Surface soil sampling points in Debris Field 4 (SO-W05-LFd)
PP20030827 - 03.JPG	Landfill – Surface soil sampling points in Debris Field 4 (SO-W05-LFa)
PP20030827 - 04.JPG	Landfill – Surface soil sampling points in Debris Field 4 (SO-W05-LFc)
PP20030827 - 05.JPG	Landfill – Surface soil sampling points in Debris Field 4 (SO-W06-LFa)
PP20030827 - 06.JPG	Landfill – Surface soil sampling points in Debris Field 4 (SO-W06-LFa)
PP20030827 - 07.JPG	Landfill – Surface soil sampling points in Debris Field 4 (SO-W06-LFb)
PP20030827 - 08.JPG	Landfill – Surface soil sampling points in Debris Field 4 (SO-W06-LFd)
PP20030827 - 09.JPG	Landfill – Surface soil sampling point in Debris Field 4
PP20030828 - 01.JPG	Unnamed Island – Surface water and sediment sampling in Pond A (SW/SE-002-UI)
PP20030828 - 02.JPG	Unnamed Island – Surface water and sediment sampling in Pond A (SW/SE-002-UI)
PP20030828 - 03.JPG	Unnamed Island – Surface water and sediment sampling in Pond A (SW/SE-002-UI)
PP20030828 - 04.JPG	Unnamed Island – Surface water sampling in Pond E (SW-001-UI)
PP20030828 - 05.JPG	Unnamed Island – Surface water sampling in Pond E (SW-001-UI)
PP20030828 - 06.JPG	Unnamed Island – Surface water sampling in Pond E (SW-001-UI)
PP20030828 - 07.JPG	Unnamed Island – Surface water sampling in Pond E (SW-001-UI)
PP20030829 - 01.JPG	Unnamed Island – Sediment sampling (Pond A)
PP20030829 - 02.JPG	Unnamed Island – Surface water sampling (Pond A)
PP20030829 - 03.JPG	Unnamed Island – Surface water sampling (Pond A)
PP20030903 - 01.JPG	Wetlands – Surface water sampling
PP20030903 - 02.JPG	Wetlands – Surface water sampling

Photograph	Description
PP20030903 - 03.JPG	Wetlands – Surface water and sediment sampling decontamination and sample staging area
PP20030903 - 04.JPG	Wetlands – Surface water and sediment sampling (SW/SE-011-WT)
PP20030903 - 05.JPG	Wetlands – Surface water and sediment sampling (SW/SE-011-WT)
PP20030903 - 06.JPG	Wetlands – Surface water and sediment sampling (SW/SE-011-WT)
PP20030904 - 01.JPG	Monastery Brook
PP20030904 - 02.JPG	Wetlands – Surface water and sediment sampling location near PZ-13 (SW/SE-014-WT)
PP20030905 - 01.JPG	Nunes Property – Surface and subsurface sampling (GP1/SO-033-NP/SO-W14-NP)
PP20030905 - 02.JPG	Nunes Property – Surface and subsurface sampling (GP2/SO-034-NP/SO-W13-NP)
PP20030905 - 03.JPG	Nunes Property – Subsurface sample (waste) – piece of garden hose collected approximately 5 feet below ground surface
PP20030905 - 04.JPG	Nunes Property – Composite soil sampling (SO-W13-NP)
PP20030906 - 01.JPG	Nunes Property – Surface and subsurface sampling (GP3/SO-035-NP/SO-W15-NP)
PP20030906 - 02.JPG	Nunes Property – Surface and subsurface sampling (GP4/SO-036-NP/SSO-01-NP)
PP20030906 - 03.JPG	Nunes Property – Surface and subsurface sampling (GP5/SO-037-NP/SO-W16-NP)
PP20030906 - 04.JPG	Nunes Property – Layered rubber waste collected from approximately 5-10 feet below the ground surface in GP5
PP20030906 - 05.JPG	Nunes Property – Layered rubber waste collected from approx. 5-10 feet below the ground surface in GP5
PP20030906 - 06.JPG	Nunes Property – GP6 – Exploratory boring. No waste or soil samples collected for laboratory analysis
PP20030906 - 07.JPG	Nunes Property – GP7 – Exploratory boring. No waste or soil samples collected for laboratory analysis
PP20030906 - 08.JPG	Nunes Property – GP8 – Exploratory boring. No waste or soil samples collected for laboratory analysis
PP20030910 - 01.JPG	Landfill - Cone Penetrometer Test (CPT) Rig – CPT6
PP20030910 - 02.JPG	Landfill - Cone Penetrometer Test (CPT) Rig – CPT6
PP20030910 - 03.JPG	Inside CPT rig
PP20030910 - 04.JPG	Sediment sampling in Blackstone River
PP20030910 - 05.JPG	Surface water and sediment sampling in Blackstone River

Photograph	Description
PP20030910 - 06.JPG	Surface water and sediment sampling in Blackstone River
PP20030910 - 07.JPG	Surface water and sediment sampling in Blackstone River
PP20030910 - 08.JPG	Surface water and sediment sampling in Blackstone River
PP20030911 - 01.JPG	Surface debris located at back of Jan Walter Pora property northeast of wetlands
PP20030911 - 02.JPG	Surface debris located at back of Jan Walter Pora property northeast of wetlands
PP20030911 - 03.JPG	Surface debris located at back of Jan Walter Pora property northeast of wetlands
PP20030911 - 04.JPG	Surface debris located at back of Jan Walter Pora property northeast of wetlands
PP20030911 - 05.JPG	Wetlands – MW-EA-2 – Located on Macklands Realty property (Plat 14 Lot 4)
PP20030911 - 06.JPG	Wetlands – MW-EA-2 – Located on Macklands Realty property (Plat 14 Lot 4)
PP20030911 - 07.JPG	New housing development located on Macklands Realty property (Plat 14 Lot 2) near MW-EA-1
PP20030911 - 08.JPG	Stockpiled building materials on Macklands Realty property (Plat 14 Lot 2) near MW-EA-1
PP20030911 - 09.JPG	Stockpiled building materials on Macklands Realty property (Plat 14 Lot 2) near MW-EA-1
PP20030911 - 10.JPG	Wetlands – Approximate area where Monastery Brook enters the wetlands
PP20030911 - 11.JPG	Wetlands – Approximate area where Monastery Brook enters the wetlands
PP20030911 - 12.JPG	Wetlands – Area near surface water and sediment sampling point (SW/SE-012-WT)
PP20030911 - 13.JPG	Wetlands – Area near surface water and sediment sampling point (SW/SE-012-WT)
PP20030912 - 01.JPG	Landfill – Viewing north from top of landfill (railroad tracks and wetlands visible)
PP20030912 - 02.JPG	Landfill – Viewing south/southwest from top of landfill
PP20030912 - 03.JPG	Landfill – Viewing south/southwest from top of landfill
PP20030915 - 01.JPG	Landfill – Installation of monitoring well SEA-601
PP20030915 - 02.JPG	Landfill – Installation of stand pipe at monitoring well SEA-601
PP20030915 - 03.JPG	Landfill – Installation of monitoring well SEA-602B
PP20030915 - 04.JPG	Landfill – Installation of monitoring well SEA-602B

Photograph	Description
PP20030916 - 01.JPG	Landfill – SEA-601
PP20030916 - 02.JPG	Wetlands – Drainage culvert from wetlands
PP20030916 - 03.JPG	Wetlands – Drainage culvert from wetlands
PP20030916 - 04.JPG	Wetlands – Drainage culvert from wetlands
PP20030916 - 05.JPG	Wetlands – Drainage culvert from wetlands
PP20030916 - 06.JPG	Wetlands – Drainage culvert from wetlands
PP20030916 - 07.JPG	Wetlands – Drainage culvert from wetlands
PP20030916 - 08.JPG	Wetlands – Drainage culvert from wetlands
PP20030918 - 01.JPG	Landfill – Monitoring well SEA-601 (completed)
PP20030918 - 02.JPG	Landfill – Monitoring well SEA-602A and SEA-602B (completed)
PP20030918 - 03.JPG	Landfill – Installation of monitoring well SEA-604
PP20030918 - 04.JPG	Landfill – Installation of monitoring well SEA-604
PP20030918 - 05.JPG	Landfill – Saturated, poorly sorted, Silt, Sand and Gravel from SEA-604
PP20030918 - 06.JPG	Landfill – Installation of monitoring well SEA-605
PP20030919 - 01.JPG	Unnamed Island - Monitoring Well – SEA-607
PP20030919 - 02.JPG	Unnamed Island - Monitoring Well Installation – SEA-607
PP20030919 - 03.JPG	Unnamed Island - Monitoring Well – SEA-608
PP20030919 - 04.JPG	Unnamed Island - Monitoring Well Installation – SEA-608
PP20030919 - 05.JPG	Unnamed Island – Standard Penetration Test – SEA-608
PP20030920 – 01.JPG	Unnamed Island – MW-607 Completed
PP20030920 – 02.JPG	Unnamed Island – MW-608 Completed
PP20030921 - 01.JPG	Landfill – Completed Monitoring Well – SEA-603
PP20030921 - 02.JPG	Landfill – Monitoring Well Installation – SEA-603

Photograph	Description
PP20030921 - 03.JPG	Landfill – Monitoring Well Installation – SEA-603
PP20030921 - 04.JPG	Landfill – Completed Monitoring Well – SEA-606
PP20030921 - 05.JPG	Landfill – Completed Monitoring Well – SEA-606
PP20030921 – 06.JPG	Landfill – Monitoring Well Installation – SEA-606
PP20030921 – 07.JPG	Landfill – Monitoring Well Installation – SEA-606
PP20030921 - 08.JPG	Landfill – Monitoring Well Installation – SEA-606
PP20030929 - 01.JPG	Landfill – Low Flow Sampling at MW-109
PP20030929 - 02.JPG	Landfill – Low Flow Sampling at B-2
PP20030930 - 01.JPG	Lenox Street – Low Flow Sampling at MW-110
PP20031004 - 01.JPG	Landfill – Low Flow Sampling at SEA-605
P1010028.JPG (Week of Oct 6, 2003)	Landfill – Trench 6 location
P1010029.JPG (Week of Oct 6, 2003)	Landfill – Trench 6 location
P1010030.JPG (Week of Oct 6, 2003)	Landfill – Haul Road
P1010031.JPG (Week of Oct 6, 2003)	Landfill – Trench 5 location
P1010032.JPG (Week of Oct 6, 2003)	Landfill – SEA-604
P1010033.JPG (Week of Oct 6, 2003)	Landfill – Lower Road
P1010035.JPG (Week of Oct 6, 2003)	Landfill – SEA 603
P1010036.JPG (Week of Oct 6, 2003)	Landfill – SEA 603
P1010037.JPG (Week of Oct 6, 2003)	Landfill – Haul road and silt fence
P1010038.JPG (Week of Oct 6, 2003)	Landfill – Haul road
P1010039.JPG (Week of Oct 6, 2003)	Landfill – Lower Road
P1010040.JPG (Week of Oct 6, 2003)	Landfill – Haul road
P1010041.JPG (Week of Oct 6, 2003)	Landfill – SEA 602A and SEA-602B

Photograph	Description
P1010042.JPG (Week of Oct 6, 2003)	Landfill – Haul road and silt fence
P1010043.JPG (Week of Oct 6, 2003)	Landfill – Test Trench 2
P1010044.JPG (Week of Oct 6, 2003)	Landfill – SEA-601
P1010046.JPG (Week of Oct 6, 2003)	Landfill – Test Trench 1
P1010048.JPG (Week of Oct 6, 2003)	Unnamed Island – SEA-607
P1010049.JPG (Week of Oct 6, 2003)	Unnamed Island – Trench 3
P1010050.JPG (Week of Oct 6, 2003)	Unnamed Island – Trench 1
P1010051.JPG (Week of Oct 6, 2003)	Unnamed Island – Trench 2
P1010052.JPG (Week of Oct 6, 2003)	Unnamed Island – Trench 3
P1010053.JPG (Week of Oct 6, 2003)	Unnamed Island – SEA-608
P1010054.JPG (Week of Oct 6, 2003)	Unnamed Island – Trench 18
P1010055.JPG (Week of Oct 6, 2003)	Unnamed Island – Trench 17
P1010056.JPG (Week of Oct 6, 2003)	Unnamed Island – Trench 5
P1010057.JPG (Week of Oct 6, 2003)	Unnamed Island – Trench 6
P1010058.JPG (Week of Oct 6, 2003)	Unnamed Island – Trench 6
P1010059.JPG (Week of Oct 6, 2003)	Unnamed Island – Trench 13
P1010060.JPG (Week of Oct 6, 2003)	Unnamed Island – Secondary road
P1010061.JPG (Week of Oct 6, 2003)	Unnamed Island – Secondary road
P1010062.JPG (Week of Oct 6, 2003)	Unnamed Island – Secondary road
P1010063.JPG (Week of Oct 6, 2003)	Unnamed Island – Secondary road
P1010064.JPG (Week of Oct 6, 2003)	Unnamed Island – Secondary road
P1010065.JPG (Week of Oct 6, 2003)	Unnamed Island – Test Pit 9
P1010066.JPG (Oct 7, 2003)	Landfill - Summa and Silco Canisters – Vent Sampling

Photograph	Description
P1010067.JPG (Oct 7, 2003)	Landfill – Air Sampling at Vent #1
P1010068.JPG (Oct 7, 2003)	Landfill – Air Sampling at Vent #2
P1010069.JPG (Oct 7, 2003)	Landfill – Air Sampling at Vent #3
P1010070.JPG (Oct 7, 2003)	Landfill – Air Sampling at Vent #4
P1010071.JPG (Week of Oct 6, 2003)	Landfill – Solid Waste Staging Area
P1010072.JPG (Week of Oct 6, 2003)	Landfill – Empty Drum Staging Area
P1010073.JPG (Week of Oct 6, 2003)	Landfill – Decontamination Pad (covered) and Water
P1010074.JPG (Week of Oct 6, 2003)	Wetlands – Recently removed railroad ties
P1010075.JPG (Week of Oct 6, 2003)	Wetlands – Recently removed railroad ties
P1010076.JPG (Week of Oct 6, 2003)	Landfill – Repaired fence at MW-108
P1010077.JPG (Week of Oct 6, 2003)	Landfill – Locked gate at MW-108
P1010078.JPG (Week of Oct 6, 2003)	Landfill – Wired/locked fence at PZ-19
PP20031024 - 01.JPG	Unnamed Island – Exploratory Trenching
PP20031024 – 02.JPG	Unnamed Island – Exploratory Trenching
PP20031024 – 03.JPG	Unnamed Island – Exploratory Trenching
PP20031024 – 04.JPG	Unnamed Island – Exploratory Trenching
PP20031024 – 05.JPG	Unnamed Island – Exploratory Trenching
PP20031024 - 06.JPG	Unnamed Island – Exploratory Trenching
PP20031024 – 07.JPG	Unnamed Island – Exploratory Trenching
PP20031024 – 08.JPG	Unnamed Island – Exploratory Trenching
PP20031024 – 09.JPG	Unnamed Island – Exploratory Trenching
PP20031024 – 10.JPG	Unnamed Island – Exploratory Trenching
PP20031024 – 11.JPG	Unnamed Island – Exploratory Trenching

Photograph	Description
PP20031024 – 12JPG	Unnamed Island – Exploratory Trenching
PP20031024 – 13JPG	Unnamed Island – Exploratory Trenching